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ELECTRICS IN ENGLAND.

Mr. F. Ayton, borough electrical engineer of Ipswich, Eng., and secretary of the Electrical Vehicle Committee that has been formed in England for popularizing the electric battery vehicle, believes that the story of electric-vehicle progress in Great Britain —"a story of splendid progress, a record of fine achievement"—will constitute a complete rebuke to present-day skeptics. In introducing the subject of electric vehicles for discussion at a special meeting of the Institution of Electrical Engineers in London, on March 19, he explained how this could only be brought about by the central stations working hand in hand with the manufacturers and carrying on an active propaganda for advertising the electric vehicle. Both the general public and those in charge of garages have to be educated, and the idea that because a vehicle is electric, therefore it is complicated, must be dispelled. Existing automobile dealers and agencies and garage proprietors cannot be expected to help, for they do not want their present business connections and profits to be interfered with; they may have doubts as to the utility of electrics; and are profoundly ignorant as to electric mechanism, merits and economy. They will only awaken to the possibilities when they see a created business around them and find a reduction in sales of gasoline vehicles. It is for such reasons as this that active advertising propaganda is essential.

Another point mentioned by Mr. Ayton was the necessity for making the charging operation as simple as possible—indeed practically automatic—and electric companies and manufacturers must see that reliable automatic apparatus is provided. It should be so constructed that when the correct terminal voltage for the whole battery (which is a good approximate indication of the battery's condition) has been reached, the charging is automatically discontinued.

Judging from some of Mr. Ayton's remarks, there appear to be too many skeptics in England who are ready to judge the present-day electric vehicle in the light of unfortunate experiences with battery vehicles in years gone by. Remembering these past records, they go so far as to openly express doubts as to the possibility of battery-driven trucks ever proving commercially successful. This is an attitude of mind that English electrical engineers recognize they must change, and they are out to do it. They have even to educate their engineering friends

in this aspect of the matter, as they have the general public and the garage suppliers and dealers on other aspects. The past few years in the general world of automobile design and practical engineering have produced many improvements for which electric-vehicle men are grateful, and skeptics are being shown that the position of electrics is altogether different today from what it was a few years ago, by reason of the great advances made in storage-battery construction, the improvement in design of motors for electric vehicles, the bringing to a high pitch of perfection of ball and roller bearings, the lightening of chassis construction and the improved efficiency of rubber tires.

The congested state of public thoroughness in all big cities imperatively demands the removal of the horse therefrom. Mr. Ayton argued that it was in the displacement of that faithful animal that the real economic future of the electric vehicle lies, and he said that upon the basis of operating costs, the electric vehicle was the only type of power-driven vehicle that could take its place.

DISPLAY LIGHTING ON MOTOR VEHICLES.

The purchase by a tobacco manufacturer of national reputation of a number of gasoline and electric motor trucks which are to be equipped with animated display lighting marks a new development in a branch of electrical service of immense possibilities. Several of these machines are now in service in the East, and the attention which they are attracting from the public on the streets through which they are operated is little short of remarkable. Just as the moving electric sign appeals with greater force to the city dweller or visitor than the stationary display of equal size, so the portable animated lighting outfit draws the attention of a clientele accustomed perhaps to the extensive use of electricity in publicity, but none the less arrested by the appeal of the migratory display.

This class of advertising is peculiarly the province of the electric vehicle on account of the nominal speed requirements and consequent long mileages obtainable per charge. Whether the installation be made on a gasoline or an electrically operated truck, however, the use of a separate battery for lighting the display and running the flasher motor is considered desirable. With such equipment the brilliancy of the lamps is independent of the condition of the main battery, and the attractiveness of the display is not affected by low voltage. A better separation of running costs can be made, also. Considering the results that a few tungsten lamps can be made to produce in this field, it is safe to predict that within the next year or two, display lighting on motor vehicles will become one of the most popular methods of publicity in the country, and if the designs are kept free from glare, it is unlikely that restrictive ordinances will be passed to limit this interesting and important development.

THE ELECTRICAL OPTIMIST.

The electrical engineer is pre-eminently an optimist. Sometimes by very practical people he is termed a visionary. But his optimism is not that of a sensationalist or an obsessed inventor; nor can he in many instances be regarded as having a predilection for castle-building in the air. He has very good reason for the faith that is in him, and his unconquerable hope for the future may be said to rest upon the sure foundation formed by a score of years of remarkable achievement.

The writer for the magazine may carry his reader with him fascinated with the story of discoveries that we hope to hear of as actual facts before long, things that are already perhaps upon the horizon, and the said reader may contemplate with wonder the age in which he is privileged to have existence. But the confidence of the electrical man of experience is very differently based; he has a knowledge which the lay reader does not possess, and looking backward can trace in detail the sure and certain way along which electrical achievement has come in so many departments. The newspaper writer and reader may lack that specialized knowledge and may occasionally be led to accept as gospel the statement of some inventor or interested financier respecting some startling discovery or apparatus. Sometimes in this way the lay reader is in his information far in advance of the electrical man who judges more from achievement than from prophecy.

But your electrical observer is none the less an optimist because he does not accept everything without question. He has learnt by experience that it is not always safe to accept inventors' or financiers' own valuations; occasionally at least he has found full justification for his caution and skepticism as the years have passed. He is an optimist because he, knowing the past so well, is able to read with greater accuracy the sign posts leading to the future. He can conceive of few fields in which electricity is not going to be supreme.

It is generally safe to follow the leading of your electrical man of vision if he be engaged in practical affairs. He is less likely to be a mere dreamer. Dr. Ferranti's vision of the All-Electric Age told to the Institution of Electrical Engineers several years ago made no appeal to the man in the street—it was hardly more than passingly referred to in the British newspapers. But to electrical men it was one of those great visions of the future which are justified by the co-ordination of a number of reasonable probabilities. Now we have another vision—a reverie he termed it—from a very prominent leader in British electrical manufacturing affairs—Mr. Hugo Hirst, chairman of the General Electric Company, Limited. He at any rate will be free from the least suspicion of being a visionary! Yet falling under the spell of electricity, he let his fancy play around the future as it will be under electrical influence. Very cheap communication by cable or by wireless with the farth-

est corner of the world. Journeys from the West of Ireland to Labrador in two and one-half days, and Quebec within three and one-half days at the outside. The expression "distant" would disappear. No particular new invention is required; only a little more perfection in what we already know, combined with a larger population at the other end, and the distances would shrink by at least 50 per cent. Within the next 30 or 40 years, if not before, Dr. Ferranti's prophecy of the "All-Electric Age" will be near fulfilment. Then the electric supply of Great Britain will be provided by less than 20 central stations, through the introduction of large and efficient units of production, and with cheap units at their disposal the price of electric current will be reduced to one-fourth of a cent per kilowatt-hour.

Mr. Hirst touched other points of a like kind in his speech, hinting at the time when electrical engineers would, if there were any of them left by then, not have to worry whether their annual conventions took place in Manchester, Sheffield or Brighton, as they would be given the option of Calcutta, London or Montreal. All of which only goes to show that though the speaker is a practical manufacturer and an electrical optimist, he is an after-dinner speaker as well. He admitted that his thoughts were merely the expression of a quiet reverie, but he had since found no reason why such a condition of affairs as he had indicated should not come to pass very soon if everybody electrical did his share of the work.

The hopes or dreams of the optimist have their valuable place to fill in our efforts to appeal to the public mind in favor of electrical service, and in these days an electrical man who is not optimistic is, when found, to be pitied,—we were going to say cast out!

STUDY THE CODE.

In order to do his work properly every contractor and wireman should be familiar with the regulations which govern that work. Just as ignorance of the law is no excuse, so ignorance of the proper manner of doing his work is no excuse for the inefficient workman. Especially in electrical construction, where defective work may result in hazards to life and property, should every worker be familiar with the recognized standards of installation.

The National Electrical Code is the general standard for electrical construction work in this country, and in many large cities this is supplemented by additional requirements which are considered necessary for acceptable installations in congested districts. In a few other places there are entire codes which have been drawn up independently, and in such places what is said here regarding the National Code would apply to such local codes. With the broadening of the personnel of the Committee which conducts the bi-annual revision of the Code, there is less occasion for these independent local codes, and as a matter of fact they are growing less in number each year.

Even where entire municipal codes are in existence or where there are additional restrictions, the provisions of the National Code are usually enforced, and every electrical contractor and wireman, in whatever part of the country he may be located, should be familiar with these provisions. Possession of a copy of the National Code is easily acquired, since the National Board of Fire Underwriters will furnish one free of charge to any person engaged in electrical work.

That all of those connected with electrical work are not familiar with these rules is evidenced by the frequency with which questions are sent to us upon points which are fully covered by the Code rules and which would never be asked by one who was familiar with them. Other indications are seen in the many instances where inspectors are compelled to order changes in wiring work. There is but one remedy for this condition, and that is for every man connected with electrical installation to study the Code.

STUDYING COMMISSION WORK.

Much as the central-station manager may regret the time required to attend to public relations in these days of multiform regulation, legislation and inquiry, he cannot afford to overlook the trend of practice in this field if he aims to operate his property on the higher planes of efficiency. It is in recognition of the far reaching significance of commission regulatory methods that the special department under Mr. Norton has been established by this journal, and it is scarcely necessary to say that it is our intention by this program to put the really significant features of commission work at the disposal of our readers in a thoroughly finished and practical form, so that those having cases of various kinds in hand will be able to glean helpful information and suggestions from the flood of new material which is pouring out of the state capitols each week.

It will not do to forget that a simple expression of an opinion by a commission on the Pacific Coast, when seized upon for local application in a somewhat similar case in Pennsylvania, may mean real money to the eastern company; and again, it is just as important to study precedents of this kind from the standpoint of dividends as it is to hunt down abrasions in feed-water-main covering or loose connections at the switchboard and meter. The subject of regulation has grown important enough to lead to the establishment of journals devoted exclusively to that branch of public service economics, and the thorough student of the subject should refer to these, but through the special department above mentioned we hope to cover the important features of the work sufficiently to keep our readers posted on all the essential phases of this interesting and significant subject.

The case in the First District of New York, which was appealed to the courts by the Kings County Lighting Company, and recently decided by the New York Court of Appeals, will be considered in detail next week. It presents several interesting and important points.

Electric Sign Manufacturers Organize Permanent Association at Chicago Meeting.

In accordance with a call issued by a committee of sign manufacturers appointed at a preliminary meeting held in Chicago on December 1, about 25 representatives of sign and accessory manufacturers met at the Hotel Planters, Chicago, March 30 and 31, and organized what will be known as the National Association of Electric Sign Manufacturers.

At the opening meeting on Monday morning George R. Hall, of the National Electric Sign Company, Jersey City, N. J., was elected temporary chairman.

At the afternoon session Chairman Hall presented a draft of the constitution and by-laws, which the committee previously appointed had prepared. A detailed discussion of this constitution was entered into and with the exception of a few minor points was adopted substantially as read. The by-laws provide for an annual meeting to be held during the summer at a time and place to be decided upon by the Executive Committee. The membership fee for active members is $50.00 and the initiation fee after May 30, $50.00, except in such cases where companies applying for membership have an annual gross business of less than $15,000. In this case the membership fee is $25.00 and initiation fee, $25.00. The constitution provides for an associate membership comprising accessory manufacturers, technical journals, etc., the dues for which are $25.00 per year and an initiation fee of $25.00 for those joining after May 30, 1914.

Membership requirements for active members stipulate that the applicant must have been in business for a period not less than one year and that the signs manufactured be of quality approved by the Underwriters.

Officers were elected as follows:

President; George R. Hall, National Electric Sign Company, Jersey City, N. J.

First vice-president; F. A. Kehl, Brilliant Sign Company, St. Louis, Mo.

Second vice-president; Norman B. Hickox, Greenwood Advertising Company, Knoxville, Tenn.

Third vice-president; T. J. Macey, Macey Sign Company, Toronto, Canada.

Treasurer; C. M. Davis, American Sign Company, Kalamazoo, Mich.

According to the constitution a permanent secretary will be appointed who will direct the affairs of the Association from an office to be engaged for the purpose.

A Membership Committee was appointed comprising Norman B. Hickox, Knoxville, Tenn.; H. I. Markham, of the Federal Sign System (Electric), Chicago; J. H. Betts, of Betts & Betts, New York; C. J. Willberscheid, The Western Display Company, St. Paul; and C. A. Wiley, The Flexlume Sign Company, Buffalo, N. Y.

Other information concerning this meeting will be found on page 669 of this issue.

Illuminating Engineers to Meet With Signal Men.

The Railway Signal Association and the Chicago Section of the Illuminating Engineering Society will hold a joint meeting on the evening of April 10, in the auditorium of the Western Society of Engineers, Monadnock Block, Chicago, Ill.

The following program has been arranged: "Fundamentals of Illumination," by W. A. Durgin; "Illumination of Railway Signals," by Thomas S. Stevens, signal engineer of the Santa Fe Railway, Topeka, Kans.; "Signal Lenses," by William Churchill, of the Corning Glass Works, Corning, N. Y.; "The Physiology of the Eye and Its Relation to Signal Affairs," by Dr. Nelson M. Black, of Milwaukee.

There will be an informal dinner at the Grand Pacific Hotel, at 6:00 p. m., and the meeting will begin promptly at 8 o'clock.

Meeting of Utah Company Section.

The regular monthly meeting of the Utah Light and Railway Company Section of the National Electric Light Association was held at the Consolidated Music Hall, Salt Lake City, on Wednesday, March 25. This was the first session held in this hall, arrangements having been made by the company to hire it for the regular meetings of the section.

The paper of the evening was presented by William M. Scott, superintendent of electric lines and service entitled, "The Relation Between the Company and Its Employees." Mr. Scott's paper was one of the most valuable which has been presented before the section. His wide experience during the past twenty years of his employment with the company has admirably fitted him to handle this subject. The Section will hold an outing at Pine Crest in June.

Convention of Steel Engineers to be Held in Cleveland.

The annual convention of the Association of Iron and Steel Electrical Engineers will be held in Cleveland, O., September 14 to 19. The secretary of the Association is W. T. Snyder, McKeesport, Pa.

Water Power on Public Lands.

Senator W. L. Jones, of Washington, in speaking before the senate on March 5, upon his bill to regulate water power on public lands, showed in a rather detailed manner the effects of present laws upon the subject and pointed out the conditions which should be remedied.

Some idea of the abundance of water-power opportunity may be obtained from his statement that the total available horsepower for water-power developments in the United States is conservatively estimated at 200,000,000, of which amount only about 6,000,000 horsepower is at present developed. Despite the overwhelming necessity for water-power development, the laws of the United States have made it difficult to finance the development of this power.

Senator Jones states that the United States imported during the year 1913 over $41,000,000 worth of nitrogenous products, all of which could be made in this country if we possessed a national water-power policy; yet the country is in great need of nitrogenous compounds for use in intensive farming and, also, in the manufacture of explosives.

Extensive hydroelectric developments for irrigation purposes in the west, he says, are practically impossible under present laws, in that either the power developed must be devoted solely for irrigation purposes thus forcing a plant to shut down six or eight months during the year, or the development must be made under a revocable permit which makes it difficult to finance the project owing to the uncertainty of the investment, and which necessitates a high rate for electric power.

Moreover, water-power developments can never be financed if the Government requires the forced amortization of the property in order that it might be turned over to the government free of cost at the end of 50 or 60 years, because the farmer could not stand the cost of irrigation water and the price of nitrogenous products produced by electrical means would be prohibited. What is needed, he claims, is a law by which the grantee can build his plant and operate it for fifty years or more, paying the United States annually five per cent of the fair market value of the land, but that after fifty years the right to use such lands should be capable of being terminated and the property taken over by the United States, the State, or a municipal subdivision thereof, upon the payment of the fair value of the property, excluding the value of the right to use such Government land.

Philadelphia Electrical Conference Discusses the Mercury-Arc Rectifier.

The March meeting of the Electrical Conference was held Thursday evening, March 26, 1914, at the Meter Department Building of The Philadelphia Electric Company, 226 South Eleventh Street. Chairman, Washington Devereux, presided, and introduced the speaker of the evening, D. Brookfield Wilson of the General Electric Company, who gave an illustrated talk on the "Mercury-Arc Rectifier". The various economies to be effected by an intelligent investigation of the proposed installation, together with the installation of the proper number and size of rectifiers were demonstrated by Mr. Wilson. He also brought out the fact that if central-station service was available this was invariably the most economical source of energy. The advantage of the rectifier as an advertising medium, when placed in the lobby of moving-picture theaters, was also dwelt upon by the speaker, as well as the fact that this apparatus was the source of the best current for moving picture projection when direct-current was not available except by means of this device.

Samuel Seata, chairman of the "Committee on Fittings and Devices," spoke of the failure of some fittings after use in the field and about 12 fittings were shown that had failed in service. Among the number were porcelain pull-chain sockets, porcelain tubes, snap switches, molding fittings, etc. This talk and the discussion following brought out the fact that the contractor should consider well the character of material supplied by the manufacturer and jobber, as the loss due to defective material usually fell upon the contractor.

A. H. Lilly, chairman of the "Question Box Committee," read the questions that had been turned in since last meeting and also gave the answers as arrived at by the committee.

Louis Grossman, chairman of the "Organization Committee," gave a short talk on the hopes and aims of his committee and asked for the co-operation of the members in this work.

That the Electrical Conference is attaining more than local fame was attested when Chairman Devereux read a telegram from Messrs. Robertson and Kingsbury, of Baltimore, regretting their inability to be present as they had requested that they be invited to attend these meetings. The discussion was participated in by Messrs. Messner, Seata, Grossman, Marley, Stern, Barry, Goldman and others.

The next meeting of the Conference will be held April 23, 1914 at 226 South Eleventh Street. The speaker will be R. Maitland Nesbitt, of the Philadelphia Fire Underwriters' Association and the subject is "Iron Conduit, its Manufacture and Use."

New Austrian Municipal Electric Plants Proposed.

The municipalities of Bielitz and Biala propose jointly to erect an electric central station to illuminate the twin cities. The estimated cost is $124,000. Construction will be begun this year. Inquiries should be addressed in German to the Stadtgemeinde, Bielitz, Silesia, Austria.

The municipality of Sniatyn plans construction of a central electric station for lighting the city. More detailed information may be obtained by addressing in German Magistrat, Sniatyn, Galicia, Austria.

The municipality of St. Ulrich in Groden has electrical works under consideration, estimated cost $80,000. Inquiries should be addressed in German to the Magistrat, St. Ulrich in Groden, Tyrol, Austria.

Chicago Electric Club.

An illustrated lecture on the "Beauties of Chicago" was delivered before the Electric Club of Chicago, on March 26, by Jen. Jensen, noted landscape architect.

Historical Dynamo Exhibited.

Included in the exhibits at the third annual display of the Missouri Valley Historical Society at Kansas City, Mo., recently was one of the first dynamos built by Edison in 1880. The first incandescent electric lights in Kansas City were run from this dynamo in the Santa Fe station of the Kawsmouth, now the Kansas City Electric Light Company.

Census Report on Electric Railways.

Preliminary figures of the forthcoming quinquennial report of the electric railways of continental United States have been given out by Director W. J. Harris of the Bureau of Census, Department of Commerce. They were prepared under the supervision of W. M. Steuart, chief statistician for manufactures.

The statistics relate to the years ended December 31 for 1912 and 1907, and June 30 for 1902. The totals include electric light plants operated in connection with electric railways and not separable therefrom, but do not include reports of mixed steam and electric railroads nor railways under construction during the census year which had not begun operations.

The figures are shown in detail in the accompanying table:

	1912.	1907.	1902.	Per Cent of increase:[1] 1902-1912.
Number of companies	1,260	1,236	987	27.7
Operating	975	945	817	19.3
Lessor	285	291	170	67.6
Miles of line	30,437.86	25,547.19	16,645.34	82.9
Miles of single track[2]	41,064.82	34,381.51	22,576.99	81.9
Cars, number	94,016	83,641	66,784	40.8
Passenger	76,162	70,016	60,290	26.3
All others	17,854	13,625	6,494	174.9
Electric locomotives	277	117	3	.....
Persons employed	282,461	[3] 221,429	[3] 140,769	100.7
Salaried employees	23,271	11,700	7,128	226.5
Wage earners (average number)	[4] 259,190	209,729	133,641	93.9
Power:				
Horsepower, total	3,665,051	2,476,479	1,349,211	171.6
Steam and gas engines (including turbines)—				
Number	2,312	2,552	2,351	—1.7
Horsepower	3,193,744	2,384,518	1,300,058	145.7
Water wheels—				
Number	383	228	159	140.9
Horsepower	471,307	91,961	49,153	858.9
Kilowatt capacity of dynamos	2,508,066	1,723,416	898,362	179.2
Output of stations, kilowatt-hours	6,052,699,008	4,759,130,100	2,261,484,397	167.6
Current purchased, kilowatt-hours	2,967,318,781	[5]	[5]	.....
Passengers carried	12,135,341,716	9,533,080,766	5,836,615,296	107.9
Revenue	9,545,554,667	7,441,114,508	4,774,211,904	99.9
Transfer	2,423,918,024	1,995,658,101	1,062,403,392	128.1
Free	165,869,025	96,308,157	[5]	.....
Car mileage (passenger, express, freight, etc.)	1,921,620,074	1,617,731,300	1,144,430,466	67.9
Condensed income account of operating companies:				
Gross income	$585,930,517	[6] $429,744,254	[6] $250,504,627	133.9
Operating revenues	$567,511,704	$418,187,858	$247,553,999	129.2
Transportation revenues	$520,184,773	$390,276,347	$235,997,005	120.4
Nontransportation revenues[7]	$47,326,931	$27,911,511	$11,556,994	309.5
Income from other sources	$18,418,813	$11,556,396	$2,950,628	524.2
Operating expenses	$332,896,356	$251,309,252	$142,312,597	133.9
Gross income less operating expenses	253,034,161	$178,435,002	$108,192,030	133.9
Deductions from income (taxes and fixed charges)	$191,123,408	$138,094,716	$77,595,053	146.3
Net income	$61,910,753	$40,340,286	$30,596,977	102.3
Dividends (operating companies)	$51,650,117	$26,454,732	$15,882,110	225.2
Surplus	$10,260,636	$13,885,554	$14,714,867	—30.3

[1] A minus sign (—) denotes decrease.
[2] Includes track lying outside the United States, namely, 1912, 31.91 miles; 1907, 27.52 miles; and 1902, 4.20 miles and exclusive of track not operated.
[3] For 939 companies in 1907 and 797 companies in 1902.
[4] Number employed September 16, 1912.
[5] Figures not available.
[6] For 939 companies in 1907 and 799 companies in 1902.
[7] Income from sale of current included. In 1912, $36,500,030; in 1907, $20,093,302; and in 1902, $7,703,574.

Speed Control of Alternating-Current Motors.

At a meeting of the Pittsburgh Section of the American Institute of Electrical Engineers on March 10, G. E. Stoltz presented the details of a practical scheme for controlling the speed of alternating-current rolling-mill motors.

Rheostatic control is satisfactory for use in conjunction with a flywheel, for moderate speed reductions, where the load is constant, but when the load momentarily goes off, the speed rises to near synchronism.

Multi-speed motors, having two separate windings on both stator and rotor, are satisfactory where two speeds are sufficient.

For more than two speeds this scheme is both expensive and inefficient.

The use of two motors connected in cascade provides four different synchronous speeds. This scheme is expensive, and not very efficient, and the control is complicated.

The polyphase commutator motor is but little used in this country. Its characteristics are similar to the direct-current motor, but the additional reactance voltage, due to the pulsating current, which is not present in the direct-current motor, introduces commutation difficulties. The inherent characteristics are such that good commutation is obtained at the expense of poor power-factor, and vice versa.

An installation has recently been made which provides exact speed control over a wide range, with the speed at any setting constant, irrespective of the load on the mill. Unlike rheostatic control it is economical, and consists of standard apparatus throughout, presenting no complications in operation or repair.

This apparatus consists essentially of a standard wound-secondary mill motor, connected to the mill directly, or by means of a gear, rope or belt drive. The secondary slip rings are connected electrically to the slip rings of a rotary converter with the same number of phases as the secondary of the mill motor. Its frequency and rating must be consistent with that obtained from the secondary of the large motor under operation. The maximum speed reduction in this installation is 30 per cent, which on a 60-cycle system is equivalent to 18 cycles on the secondary. As the locked secondary voltage of the main motor is 552 volts, the secondary voltage corresponding to 18 cycles is 166, corresponding to 272 volts on the direct-current end of the three-phase rotary converter. The direct-current terminals are connected to the direct-current machine of a motor-generator set, the alternating-current machine, a standard squirrel-cage motor, being connected directly to the three-phase line. Each of these machines has a capacity equal to 30 per cent of that of the main mill motor.

In operation, the converter takes current from the secondary of the mill motor, and returns it, through the motor-generator set, to the line, the squirrel-cage machine acting as an asynchronous generator when running above synchronous speed. The synchronous speed of the mill motor under these conditions is equal to 60 cycles minus the frequency of the converter, which depends on its speed, which, in turn, with constant field excitation, depends on the voltage impressed across its direct-current terminals. This voltage, and hence the speed of the converter, and the speed reduction of the mill motor, depends on the excitation of the direct-current machine of the motor-generator set. At maximum excitation the mill motor speed is reduced to 30 per cent. At zero excitation, the speed of the mill motor is the same as if its secondary was short-circuited. With the fields reversed, and full excitation applied, the mill motor will run approximately 30 per cent above synchronous speed. In this case, the speed of the motor-generator set drops below synchronism and the squirrel-cage machine draws power from the line, feeding it through the rotary converter into the mill motor, which thus receives power at both its primary and secondary terminals. The speed characteristics of the outfit can be designed to give the mill motor practically constant speed, regardless of load, or to provide sufficient speed drop to take advantage of a flywheel. The complete outfit has a full-load efficiency of 84 per cent, with a speed reduction of 30 per cent.

In the discussion, in which Messrs. Dudley, Lincoln, Crosby, Swoboda, Wood, Sykes, and Stoltz participated, the following points were brought out.

In Germany, a very similar application is made, except that the direct-current motor, instead of being part of a motor-generator set, is coupled or geared directly to the mill shaft.

The power-factor of the combined set can be made unity or better, on account of the high excitation of the rotary converter. The scheme is not new, but represents simply a practical application of standard apparatus. Its principal features are reliability, and reasonable efficiency. The fact that it involves only well known apparatus, makes it easily cared for, and if a change in operation occurs later, the apparatus can all be readily used for other purposes.

The Sherbius, or polyphase commutator-motor scheme, while new in this country, has been in use in Europe without very great success. It requires high-grade operators, and is clumsy and complicated.

Connecting the direct-current motor to the mill shaft instead of to an alternating-current generator is quite satisfactory where constant horsepower output is desired. Usually constant torque is the requisite, in which case it is more efficient to return the energy to the line. Moreover, a slow-speed motor is required to help drive the shaft, which might easily be more expensive than a high-speed motor-generator set.

Wireless Lecture by Dr. Thomson.

At a meeting of the Commercial Club held in Boston, Mass., on March 23, Elihu Thomson, of Swampscott, Mass., dwelt upon the possibility of wireless transmission and expressed the belief that soon a microphone transmitter would make it possible to control 100 horsepower. It will be only a few years before wireless telephony will be in practical effect across the Atlantic, he said.

Dr. Thomson began experimenting in wireless transmission in 1875, when he was an instructor in chemistry in a Philadelphia high school, working in conjunction with the late Prof. E. J. Houston.

Salt Lake City Commissioners Decide on Liability Insurance for Electric Signs.

The proposition made by the Utah Light and Railway Company to the commissioners of Salt Lake City to furnish a blanket bond for electric signs to protect the city in case damage results from the signs falling or otherwise, has been rejected by the Commission. They have decided instead to take out liability insurance on electric signs and charge the cost of the insurance against the sign owners. The Commission reached this decision after carefully investigating the matter.

Coal Miners Demand Use of Electric Power.

A conference was recently held in the Betz Building, Philadelphia, Pa., between certain operators and miners of bituminous coal. The miners demanded that the cars that move in and out of the collieries should be operated by electric power instead of by the men. The operators refused to grant this demand on the ground that it would increase the cost of the production from 7 to 14 cents per ton. The cost of an electric power plant would be approximately $150,000.

Electricity in Coal Mining.

This article treats particularly of the application of central-station power to the coal mining districts of the Middle Western States. The advantages of motor drive are discussed and data presented on the cost of mining using central-station power and isolated-plant service.

The use of electricity in coal mining is not new, as it has been employed to a limited extent for many years. Recently, however, rapid advances have been made in completely electrifying coal mines and it is now generally conceded that electrical apparatus will supersede steam equipment as rapidly as the change can be made.

A few years ago it would have seemed almost ridiculous to have intimated that central-station service could successfully compete with isolated-plant service for the operation of coal mines. Today, however, many mines, of all types and sizes, are purchasing power and the results being achieved indicate that within the next five years a majority of the coal mines will be operated by central-station power. The significance of this will be realized when it is learned that the 1911 census figures placed the total output of coal of the United States for that year at 500,000,000 net tons. The figures for 1913, it is claimed, will show an increase of fully 20 per cent.

In view of these figures it is evident that the power requirements of this industry represent an annual outlay of such proportions as to justify the most careful scrutiny of all factors entering into the cost of producing and applying the energy required for the numerous mechanical aids which have become indispensabe to modern coal mining.

Perhaps the most important advantage of electricity is its economy. The necessity for long lines of steam or air piping, which are expensive to install and maintain is entirely eliminated by the use of electric power, which at once renders possible the application of a single form of power to all classes of machinery, both on the surface and in the mine itself.

Electricity substitutes a simple and thoroughly flexible system of transmitting power by means of conductors which can be easily run and rapidly extended to meet changes, involved in progress of development, and which are not affected by temperature variation and are not liable to mechanical injury or to breakage due to floods or shifting ground. They can be safely used in places where steam lines would introduce an element of danger, and finally, they can in many instances be run in shafts or bore holes already in

Electrical Coal-Cutting Machine at Work in Coal Mine.

use for other purposes without occupying room that could be otherwise utilized.

Notwithstanding the remarkable efficiencies which have been obtained by the engineers of some mining companies in the operation of carefully constructed steam lines, the investment and operating expense of this method has been so heavy that resort to the alternative of separate boiler plants even in comparatively closely grouped developments has often been found necessary.

In the application of electric motors to the various machines the characteristics of modern types of both alternating and direct-current motors are such that in a majority of cases they can be direct-connected or direct-geared to the driving shaft, thereby eliminating a large percentage of the friction losses and repair charges, as well as the first cost of the belting and countershafts.

It is also possible to further reduce the power losses by substituting individual drive in the sections of long conveyor or scraper lines, and for the different units in breakers and tipples, thereby effecting a considerable saving in power over that required by the older method of group operating by means of engines. In the case of motor-driven breakers, the saving effected in belting alone is a very considerable item, but due to the design of some of the breakers and tipples, the retention of some belts and countershafts is still necessary. For the driving of coal crushers the interposition of belting is not usually considered in modern equipments as the motors are capable of carrying heavy overloads for the short periods during which they are liable to occur in this particular service.

The flexibility of motor drive renders possible the use of portable machinery, and additions to or changes in the location of existing machines can easily be arranged for without interfering in any way with the operation of the remainder of the equipment.

The benefits of electric lighting, both in the mine and for night operations on the surface and for signaling, are universally acknowledged, and electric current is used for these purposes even in mines which have not as yet adopted electric power service.

In a previous article in this journal treating of the use of electricity in coal mines (March 1, 1913, page 435) particular attention was given to the practices of the Eastern coal states, principally Pennsylvania, Virginia and West Virginia. However, the conditions found to obtain in the middle Western states do not differ materially as regards the application of central-station power and electric motors.

Contrary to the situation encountered in Eastern coal mines, the mines in Illinois are fairly dry and practically devoid of dangerous gases. Faults in the structure of the earth are prevalent, however, and the shafts are lined with concrete to prevent slides. The interest on the investment for constructing such shoring and benching in the different levels counterbalances the cost of pumping in wet mines.

Typical Mine Motor-Generator Set.

Electric Gathering Locomotive in Mine Shaft.

The primary operations involved in the production of coal are undercutting, transporting, and hoisting. The secondary operations, as far as power requirements are concerned, are ventilation, drainage or pumping, operation of tipple and other outside machinery.

In connection with cutting, it is interesting to note that the electric coal cutter is estimated as reducing the cost of production of coal from 10 to 12 cents per ton. This operation is one offering a very good load for power as it is fairly continuous throughout the day hours up to 3 or 4 o'clock in the afternoon.

The combined problems of cutting and hauling form the nucleus around which an electric installation can be made, and while it is proposed to discuss the question of installation costs a little later, it should be noted that

TABLE OF COMPARATIVE COSTS BETWEEN PURCHASED POWER AND ISOLATED-PLANT SERVICE.

Items Included in Cost.		Total Present Cost	Amt. Saved with Purchased Power
Three engineers at $85.00		$255.00	$110.00
Two firemen at $75.00		150.00	150.00
One helper at $50.00		50.00	50.00
500 tons of coal at 50c per ton		250.00	250.00
Oil, waste and packing		50.00	40.00
Boilers:			
Cost, including stack	$4,000.00		
Feed pumps	200.00		
Setting and foundation	800.00		
Feed water heater	400.00		
	$5,400.00		
Interest at 5 per cent		22.50	22.50
Depreciation 7 per cent		31.50	31.50
Repairs and upkeep		50.00	50.00
Insurance		10.00	10.00
Boiler Building:			
Cost $2,000.00			
Interest at 5 per cent		8.35	8.35
Depreciation at 5 per cent		5.00	5.00
Upkeep and repairs		5.00	5.00
Engines:			
Cost two generator engines	$3,000.00		
Hoist engine	1,500.00		
Fan engine	600.00		
Elevator engine	200.00		
Screen engine	150.00		
Conveyor engine	100.00		
Pumps	400.00		
Machine shop engine	150.00		
	$6,100.00		
Interest at 5 per cent		25.40	25.40
Depreciation at 6 per cent		30.50	30.50
Upkeep and repairs		30.00	30.00
Building:			
Cost $2,500.00			
Interest at 5 per cent		10.40	
Depreciation at 5 per cent		10.40	
Upkeep and repairs		5.00	
Piping:			
Cost $1,500.00.			
Interest at 5 per cent		6.25	6.25
Depreciation at 7 per cent		8.75	8.75
Upkeep and repairs		15.00	15.00
Generator, switchboard and wiring:			
Cost $2,640.00.			
Interest at 5 per cent		11.00	11.00
Depreciation at 5 per cent		11.00	11.00
Upkeep and repairs		15.00	15.00
Superintendence		25.00	
Taxes at 1 per cent of valuation (assessment 90 per cent)		15.00	7.50
Liability insurance at $1.33 per $100.00		6.05	4.15
Overhead		50.00	
Total cost		$1,165.45	$900.25
Fixed charges		284.40	
Operating expenses		881.05	

these two problems are usually considered at one time in determining upon such improvements. A number of factors enter into the question of such improvements and where the older mines are not equipped with mechanical haulage, it is necessary in most cases to relay the track with heavier rails to stand the weight of the locomotive, which must necessarily be heavier than the cars in order to offer sufficient draw-bar pull to permit of bunching cars into trains and cut down the labor attendant upon the old system.

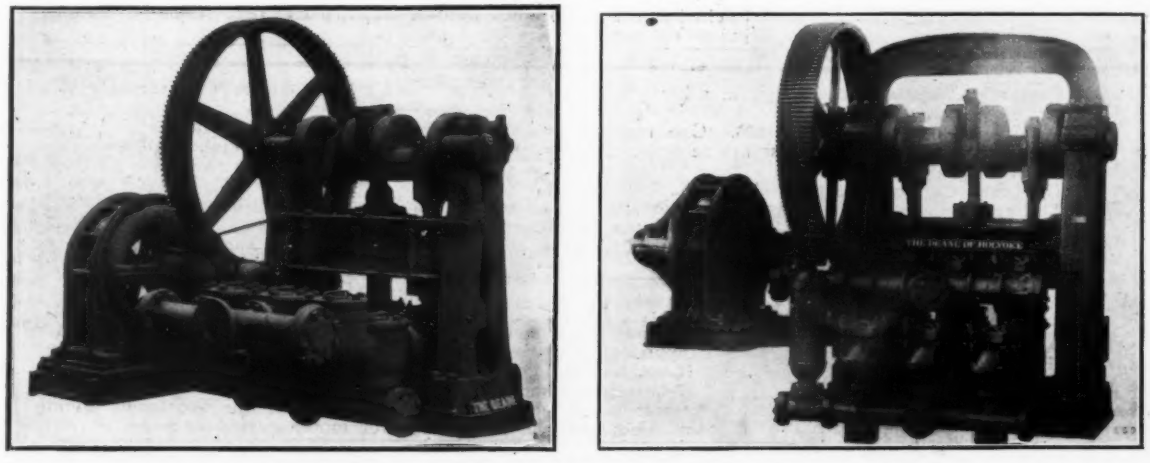
After a mine has assumed commercial proportions with any considerable development away from the entry or shaft, it is seldom difficult to demonstrate the possible savings in the use of suitable and well designed electric haulage equipment.

The relative importance of the pumping equipment in different coal mines is dependent upon the geological conditions encountered. In many mines the service required constitutes a comparatively negligible demand on the power station, owing to the possession of natural drainage facilities, with a resulting limitation of the pumping units to those required for fire protection and a few dip pumps operating at low heads.

On the other hand, a large percentage of the mines situated below local water levels are absolutely dependent for continuous operation on the efficacy of their pumps or water hoists, and the cost of their operation has a vital influence on the obtainable margin of profit. The importance of this factor can be fully apppreciated when it is realized that in many mines more than ten tons of water have to be elevated to the surface for every ton of coal mined. In addition to this the pumping outfit must ordinarily have sufficient reserve capacity to cope with excessive demands due to floods having their source either on the surface or in water bearing ground which is likely to be encountered in extending the workings.

As in the applications already referred to, the electrical operation of pumps renders possible increased economies and efficiencies otherwise unobtainable, and the benefits derived as compared with either steam or air power service increase in direct proportion to the diversity of the applications and the distances over which the power has to be transmitted.

The motor-driven hoist is the simplest and most compact form, inasmuch as the motor can usually be mounted on a common base with the hoisting drum and arranged to drive it directly through gears, thereby form-



Two Typical Mine Pumping Units with Motors Geared Direct to Pumps.

Coal Mining Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Coal mine, having an average production of 10,700 tons per month.

Total connected horsepower, 455. Total number of motors installed, 5. Average kilowatt-hours per month, 37,655.

Kilowatt-hour consumption for 9 months:

Month	Kilowatt-hours	Tons Coal	Month	Kilowatt-hours	Tons Coal	Month	Kilowatt-hours	Tons Coal
April	26,900	11,571	July	37,800	11,585	October ...	57,700	12,102
May	29,000	9,262	August	43,800	12,258	November .	43,200	9,407
June	29,500	8,742	September .	41,400	11,050	December .	29,600	10,752

Load-factor, 15 per cent.

The average energy consumption per ton of coal mined is 3.4 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	300	900	Direct-connected to one 200-kilowatt, 250-volt, direct-current generator for supplying energy to the following: one 12-ton haulage locomotive; one 10-ton haulage locomotive; two four-ton gathering locomotives; three 30-horsepower cutting machines; and one 15-ton Larry motor.
1	100	720	Slip-ring motor belted to shafting driving one automatic feeder; three sets of shaker screens; two jigs; one pump; two drag lines, 100 and 50 feet respectively; four elevators, 330 feet; one crusher; and one 60-foot picking table.
2	20	720	Each belted direct to a 16-foot Crawford & McCrimon fan.
1	15	900	Geared direct to deep-well pump.

Coal mine, having an average monthly production of 22,000 tons. This mine uses no cutting machine inasmuch as the coal formation is such that it is not necessary. There is still some steam haulage equipment that has not as yet been changed over.

Total connected horsepower, 325. Total number of motors installed, 3. Average kilowatt-hours per month, 17,300.

Kilowatt-hour consumption for 9 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
June	16,000	September	18,500	December	16,100
July	16,500	October	20,500	January	16,000
August	17,000	November	17,300	February	17,300

Load-factor, 9.7 per cent.

The average electrical energy consumption per ton of coal mined is 0.78 kilowatt-hour.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	225	900	Direct-connected to a 150-kilowatt, 250-volt, direct-current generator supplying energy to the following: one 12-ton haulage locomotive; one 10-ton haulage locomotive; one five-ton gathering locomotive; and one 15-horsepower motor, 900 revolutions per minute direct-connected to pump.
1	40	840	Belted direct to a 16-inch Cappell fan, speed 98 revolutions per minute.
1	40	570	Slip-ring motor, operating tipple.

Coal mine, having an average monthly production of 20,000 tons. Some steam equipment is still temporarily retained.

Total connected horsepower, 225. One motor. Average kilowatt-hours per month, 10,926.

Kilowatt-hour consumption for five months: August, 10,550; September, 7,560; October, 10,390; November, 11,300; December, 14,833.

Load-factor, 8.9 per cent.

The average electrical energy consumption per ton of coal mined is 0.54 kilowatt-hour.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	225	900	Direct-connected to one 150-kilowatt, 250-volt, direct-current generator supplying energy for the following direct-current equipment: one 10-ton haulage locomotive; one six-ton gathering locomotive; one 15-horsepower motor direct-connected to 12-foot fan; one 15-horsepower motor belted direct to 14-foot fan; one short-wall mining machine; and one five-horsepower motor geared to pump.

ing an entirely self-contained unit and effecting an economy in weight and in the amount of space required for its installation, which is often of appreciable importance when the hoists are located in the mine. Owing to the superior speed contact of the electric type it has a great flexibility in operation and its extreme simplicity not only minimizes the cost of repairs, but obviates the necessity for the service of an engineer in running it, as the average worker is competent to receive the limited amount of instruction necessary and can be safely entrusted with its operation. Emergency demands on the ability of the operator are, as a rule, reduced by providing safety devices in the form of signal lamps, bells, or automatic cutouts, and for conditions such as those imposed by the use of motors for driving the type of water hoist commonly found in the anthracite fields, the hoisting equipment can be made entirely automatic in operation.

The power losses involved in the operation of an engine-driven breaker are unavoidably great, due to the complex mechanical transmission of the energy through numerous shafts, pulleys, sprockets, sheaves, belts, ropes and chains interposed between the prime mover and the machinery actually performing useful work, and which, in addition to consuming a large proportion of the available energy occupy a very considerable amount of space and serve to complicate the internal arrangement of the breaker. Owing to the severe service conditions the belt renewals and general repair work constitute a continuous and heavy expense and very little saving in the primary power required is possible when the breaker is operating on partial loads.

A realization of the efficiency of engine drive has led some of the coal operators to equip breakers of modern construction with individual motor drive, which, by eliminating a large percentage of the shafting, belting, etc., effects a great reduction in the power losses and maintenance charges, and by rendering it possible to run the various portions of the machinery independently, makes the power cost, when only part of the equipment is used, directly proportional to the amount of productive work.

The earliest attempt at individual motor drive was made with direct-current inclosed motors, and was only partially successful, as the intense vibration inseparable from breaker operation tended to cause commutator troubles.

In those breakers where induction motors were used, the simplicity of the rotor and the absence of moving electrical contacts resulted in a practically complete immunity from motor troubles, and the breakers were supplied with current from a central generating station; no local reserve power plant being required.

For driving tipples individual motors have heretofore been more generally used than in breakers, and the typical modern steel tipple is usually equipped with separate motors for the conveyors, picking tables, screens, crushers, etc., although in some cases they are driven in groups by one or more large motors.

When long conveyor or scraper lines are used the power waste inherent in rope transmission may be reduced by using a centrally located motor or individual motors for separate sections.

The accompanying table which is taken from a paper presented by Graham Bright before the American Institute of Electrical Engineers gives specific information relative to the economies that can be effected by the use of purchased power in the operation of mines.

Commercial Practice
Management, Rates, New Business

High Peak Loads on Boston Dark Days.

The extraordinary weather conditions prevailing in Boston, Mass., March 18 and 23 produced abnormally high peak loads on the generating station of the Edison Electric Illuminating Company. During the morning hours of March 18 a dense black cloud enshrouded the city and suburbs, later resulting in rain. The darkest time was about 10 o'clock, when all the stores and many residences were lighted as at night. At 10:15 a. m. the load reached 54,456 kilowatts, or within 16 per cent of the greatest peak for the year 1913.

The following table shows the rapid increase from hour to hour:

7 a. m.....12,293 kilowatts.
8 a. m.....25,388 kilowatts.
9 a. m.....35,993 kilowatts.
10 a. m.....54,456 kilowatts.

The dark period of March 23 occurred in the latter part of the afternoon. At about 3 o'clock heavy clouds accompanied by violent snow squalls enveloped the territory in gloom. Most of the 50,000 customers of the Edison Company turned on their lights, and the City of Boston called for street lighting out of schedule the first time in ten years and only once before since the "yellow day" of 1881. By 3:55 p. m. the demand caused an increase in load at the L Street station at the rate of 1,000 kilowatts per minute. The normal demand at 4 p. m. at this season is about 33,000 kilowatts. The load on this day showed a maximum soon after four o'clock, of 56,835 kilowatts, or within 11 per cent of the greatest peak for the year 1913—63,131 kilowatts. The following was the recorded load during the dark hours of the afternoon of March 23.

2 p. m.....32,512 kilowatts.
3 p. m.....33,763 kilowatts.
4 p. m.....51,837 kilowatts.
4.15 p. m.....56,835 kilowatts.

Utah Light and Railway Company Demonstrates Heating and Cooking Devices.

Upon the invitation of the Home Economic Section of the Ladies' Literary Club, the Utah Light and Railway Company gave a practical demonstration of the operation of electric cooking and heating appliances before this section at the Club's new home, on East South Temple, Salt Lake City. Miss Helen L. Bartlett, teacher of cooking in the Salt Lake High School, read a paper entitled, "Electricity, and Its Application to Household Efficiency." Mrs. Olive Huppert, demonstrator for the Utah Light and Railway Company, gave a practical demonstration of the various electric cooking appliances available, and served a dainty electrically cooked luncheon at the close of the session to more than 100 ladies present.

Miss Bartlett's paper provoked a most interesting discussion.

Kansas City Central Station Has Luncheons for Department Heads.

The Kansas City Electric Light Company, Kansas City, Mo., has inaugurated a system of monthly luncheons for the heads of the various departments of that company and of others which are affiliated with it, including the Standard Electric Light Company, of Kansas City, Kan., and the Metropolitan Street Railway Company. The luncheons will be held on the first Saturday of each month at the Mid-Day Club, in the Commerce Building. While the social features alone are regarded as thoroughly worth while, the chief benefit is expected to result from the discussions between the department heads. It is planned to give each manager of a department as much insight into the workings of other departments as possible, the result being maximum efficiency in all.

Telephone Rules of New York Edison Company.

Believing that its customers can be best served and the company's business facilitated by the adoption of a universal method of answering the telephone, the management of The New York Edison Company has compiled a set of telephone rules which have been distributed to every one of the four hundred odd members of the contract and inspection department of the lighting company.

Four different cards have been circulated in all, two going to each individual employee, and one, a larger card, going to the department managers and bureau heads. These last are put in a conspicuous place in each office, in an effort to keep the idea of good telephone service constantly before the employees. The fourth card was an advertising novelty in the form of a large tag to be hung above the employees' desks.

The first card sent to the employees contained the following information:

"Please answer your telephone with the name of your bureau and your own name, instead of 'Hello'—as, 'Special Service Bureau, Mr. Brown speaking.'

"In calling individuals, if their bureau answers, give your name or bureau at once, as 'Mr. Jones, please, Mr. Brown speaking,' or 'Mr. Jones, please, Follow-up Bureau speaking.'"

The second card, which followed soon after the first, gave brief instructions to employees when calling outside numbers, as follows:

"When telephoning any one please give the number to the operator and hold the wire until you get the party called. The operator should not be expected to remember numbers or to look them up.

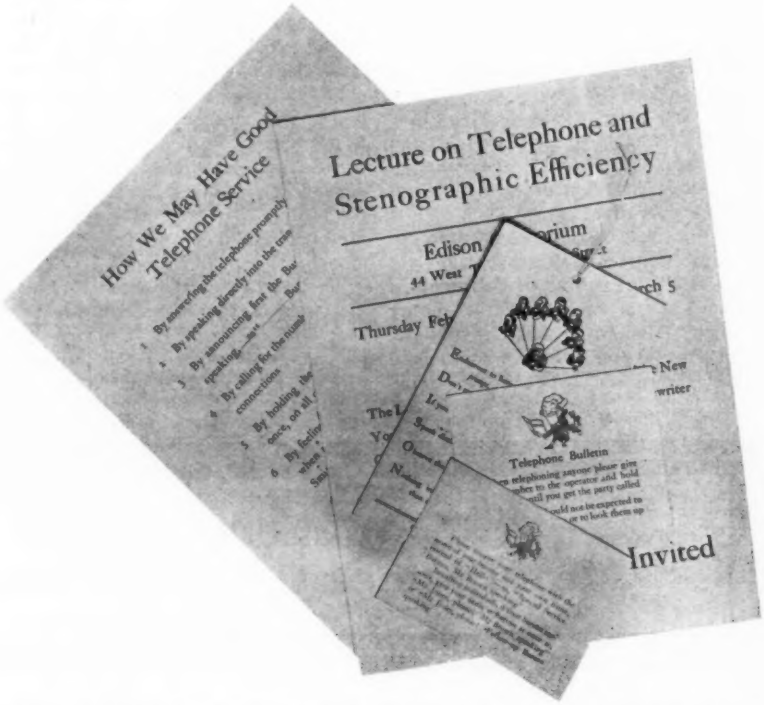
The following general rules, under the heading "How We May Have Good Telephone Service," were printed on a large card and sent to the heads of the different bureaus with instructions to display them prominently on the office bulletin board: (1) By answering the telephone promptly and pleasantly. (2) By speaking directly into the transmitter. (3) By announcing first the bureau, then the person calling. (4) By calling for the number, not the name, on outside communications. (5) By holding the line and being ready to speak at once on all connections. (6) By feeling responsible for a neighbor's telephone. And so, complete information and courteous treatment will convince our customers that we are always at their service."

All four cards are arranged with great care typographically, the always courteous Edison Man being conspicuous.

Following the circulation of these rules, arrangements were made with officials of the Edison Company's commercial school for a special lecture for telephone operators and stenographers at the Edison Auditorium, in Twenty-seventh Street. W. I. Oldaker, of the New York Telephone Company, was invited to deliver an address on "Seven Rules of Telephone Service." This lecture, with another lecture delivered at the same meeting, was subsequently published in the Edison Weekly, the lighting company's employees' journal.

Voluntary Reduction in Boston Street-Lighting Rates.

As the result of conferences between the commissioner of public works of Boston, Louis K. Rourke, and officials of the Edison Electric Illuminating Company, a rate of $87.53 per lamp per year has been agreed upon at which the Edison Company will supply energy to the city's arc lamps used in street lighting. The lamps are of 6.6-ampere capacity, and number about 5,000. The contract runs for 10 years, and if accepted by the City Council after hearing will go into effect April 1.



Literature Published by New York Edison Company to Improve Its Telephone Service to Customers.

The rate prevailing under the five-year contract between the Edison Company and the city, which expires on April 1, has been $103 per lamp. Under the terms of this contract the city should have notified the company a year ago that a revision of the terms was to be sought. No such notice having been served, the company was privileged to continue the present rate for another five-year period. The Edison officials, however, waived their right to this extension and agreed to the rate mentioned, which represents a saving of $77,350 per year to the city.

The Boston Consolidated Gas Company agrees to furnish gas lights at $20.60 per year. However, Mayor Curley is working to secure a rate of $20, and states that if this rate is not granted, the project of replacing gas lamps with electric lights will be taken up.

New-Business Activities in Louisville.

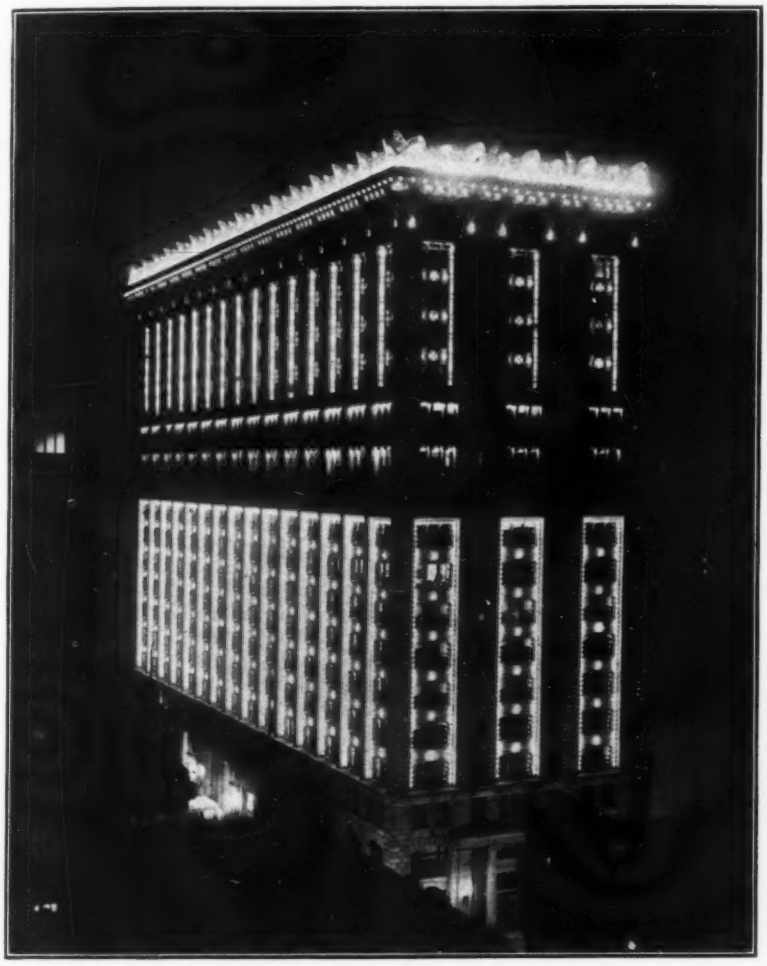
The Louisville (Ky.) Gas & Electric Company has recently completed the installation of a variety of electrical equipment for the Kentucky & Indiana Bridge & Terminal Railway Company, including a 10-horsepower motor which operates car-icing equipment by means of which a refrigerator car is iced in two minutes, yard-lighting equipment and a Mazda series-lighting system for the company's new bridge across the Ohio River.

The reorganized commercial department of the company secured contracts for 6,479 horsepower of new electrical business in the six months ended February 1, 1914. New electrical customers numbered 2,159. The new lighting business contracted for aggregated 3,034 horsepower, and the additional power business 3,433 horsepower. Contracts for natural gas for industrial purposes call for an estimated annual consumption of 221,640,000 cubic feet, and these were taken at the rate of 35 cents per thousand cubic feet.

Lighting of New Offices of New York Edison Company.

One of the most studied and carefully worked out examples of the exterior illumination of a large building is to be found in the new home of The New York Edison Company at Irving Place and Fifteenth Street. The present artistic scheme of decorative lighting was evolved after months of experimenting and testing by the company's illuminating engineers. Lamps of various candlepower were tried at different distances apart and at numerous points and angles, the results being carefully observed several blocks away. There are 4,000 Mazda lamps used on the outside of the building alone, ranging from 10 watts to 500 watts and aggregating 128,000 candlepower. This is approximately as much illumination as glows from a battery of the most powerful searchlights now used in the navy, or as is used to light a mile of Fifth Avenue, or to dispel the darkness in Central Park.

The brilliancy of the illumination is accentuated by the gilt trimmings of the building. The coping may be said to resemble a golden crown of light. In design this coping appears to consist of large and small spreading fans set alternately a short distance apart. The decorative surface of these fans is covered with gilt, the large fans being 8 feet high. The illumination is at the foot as the footlights of the stage. From a distance this surmounting feature takes on the appearance of a delicate tracery of gold lace.



Facade Lighting of New York Edison Company's New Office Building.

Strenuous House-Wiring Campaign in Columbus, O.

A second campaign on a still more popular plan than that of a few months ago, is just being launched by the Columbus Railway, Light & Power Company, to increase the number of customers for its residence service. It is a co-operative arrangement between the company and six of the leading electrical contractors of the city. By the terms of the contract the consumer may have eight rooms wired complete, with first-class fixtures, equipped with handy pull-chain sockets, suitable glassware and 40-watt Mazda lamps, for the sum of $49.75, on easy payments. Superintendent Wolls, of the new business division has been at work upon the plan for some weeks, and believes that contract to be the most simple and the most liberal that has ever been put in force anywhere. Attached to the contract signed by the customer are illustrations of all fixtures to be used. The fixtures are furnished and installed by a high-class house. A force of ten salesmen has been put to work, with the view of covering the entire city. They are provided with information which will permit of prompt estimate being made on extra features. The contractors co-operating in the campaign will carry deferred payments.

The company expects that not less than 1,000 new customers will be added to its residence service through this popular effort.

Central-Station Power for Excavating River Bed.

The J. H. Cahill Company, which is doing a good deal of rock and earth excavating in Louisville, Ky., in connection with its job of concreting the bed of Beargrass Creek, has installed a battery of four drills, driven by compressed air. A 60-horsepower Westinghouse motor drives a 350-cubic feet Ingersoll-Rand compressor, and this equipment has supplanted the steam drills which were at first used on the job. The Louisville Gas & Electric Company has built a temporary line to the point at which the work is being carried on. This class of business forms a very profitable central-station load.

New England Central Stations Find Means for Protection from Accident Suits.

As a means for protecting themselves from possible suits for damages, two hydroelectric companies in New England require a contract from visitors to their generating stations which stipulates that the visitor assumes all risks to person and property while on the premises.

The Bar Harbor & Union River Power Company, which operates a 2,250-kilowatt hydroelectric plant at Ellsworth, Me., has a contract to the above effect which is printed on a long sheet of strong paper and attached to the station wall near the entrance. Visitors to the station sign this paper before inspecting the plant.

The Connecticut River Transmission Company and the Connecticut River Power Company, which operate the widely known generating plant at Vernon, Vt., on the Connecticut River, issue a pass to applicants for admission to the power house or substations. This pass is in the form of a card, on the back of which are printed the following conditions which constitute a contract with the user:

"In consideration of its receipt and use, any person entering the power house or substations under this ticket voluntarily assumes all risks of accident, and it is expressly agreed that the Company shall not be liable under any circumstances, whether by negligence of itself, its agent, or otherwise, for any injury to the person, or for any loss or injury to the preperty of anyone so using it."

Another Use for Edison Current.

The Forbes water sterilizer, which was installed in the Forty-second Street Building of the New York Edison Company last spring, has just completed its first six months of service. During that time it has supplied drinking water for the Delancey Street, the Harlem, the Broadway, and the Forty-second Street offices. Some interesting figures have been worked out as to the cost of operation of such a machine compared with the seemingly simpler method of buying water. In the first place the machine is of an automatic type and required no extra help to take care of it. The cost of the current used at ten cents per kilowatt-hour would have been $53.84, which marks the total expenditure. During the six months 979 five-gallon bottles of water were sterilized and used; these at fifty cents per bottle would have cost $489.50, making the total saving for the six months $435.66. It is interesting to note that from May through July the number of bottles used monthly steadily increased until 186 were consumed in the latter month. Then, as the weather became cooler, the number fell off, 127 being the October figure.

The cost of the outfit was $1,065, the machine itself being $650, and the bottles and coolers $415. As compared with the investment the saving of $435 in six months' time is an enormous amount. This saving could be made even greater, however, for in the case of a concern large enough to use the amount of water the machine is capable of producing, current could be supplied at wholesale rates considerably under ten cents per kilowatt-hour.

Review of Philadelphia Electric Company's Business.

The Philadelphia Electric Company in a special bulletin covering the work of the year of 1913, announces that in that year its net increase, in connected load, was equivalent to 627,572 50-watt lamps. Before the end of the present year it will have more than the equivalent of 4,000,000 50-watt lamps connected to its circuits, an increase of 100 per cent in five years. During the year of 1913 a number of important power contracts were closed, including one for 2,000 horsepower in motors for the new Girard Point elevator of the Pennsylvania Railroad.

The earnings of the Philadelphia Electric Company were much larger during 1913 than any year previous. The annual report covering operations for the year, ending December 31, was submitted to the directors at their recent meeting. It was unofficially reported that the gross earnings were approximately $7,700,000, or an increase of about 10 per cent over the preceding year, when they were $7,051,497. The net earnings are said to be about $2,000,000 which would be equivalent to 8⅞ per cent on $22,500,000 paid in capital of the company. In 1912 they were $1,666,190, or about 9.5 per cent on $17,500,000 capital. The exact figures of the report will be made public at the annual meeting of the stock holders to be held in Camden on April 8.

Special Toaster Campaign in Boston.

The Edison Electric Illuminating Company of Boston is offering electric toasters of the Landers, Frary & Clark Thermax manufacture at $2.95 for a limited time. The use of this appliance is demonstrated in the company's show window, the process being conducted in the presence of an interested multitude outside, to whom the crisp toasted bread resulting looks inviting. The Edison Company is advertising the use of this little breakfast-table accessory as "the modern way to start the day", and enumerates some 50 supply dealers in all parts of its territory who will give information and demonstrate the advantages of the toaster.

Boston Employees' Campaign to Increase Load to 200,000 Kilowatts.

In order to stimulate the volume of sales and the general growth of the business, the Edison Electric Illuminating Company of Boston is conducting a campaign among its employees looking to the securing of a connected load of over 4,000,000 50-watt equivalents before July 1.

The campaign began about the first of February, when the company's load was 3,764,000 equivalents, and interest has been aroused and stimulated by means of a letter from Superintendent W. H. Atkins to every employee in which he urged every person in the company's service to join in this campaign; the company publication, *Edison Life*, carried forward the project through advertisements and editorially calling upon the employees to work toward the desired end. Placards posted throughout the company's offices, call attention to the same thing, and a "thermometer" indicates the progress of the campaign. Every letter passing between the various departments bears the following slogan, stamped upon it:

4 MILLION
OR MORE
JULY FIRST
OR BEFORE

On March 27 the company's total connected load was 3,814,852 equivalents. The average of 1,900 equivalents per day are needed to reach the goal, and it is the belief of the employees that the end will be accomplished. Every employee of the 2,000 in the Edison Company's service is interested to work among his friends and neighbors. The total of 4,000,000 equivalents is to be net, with service discontinued deducted.

Central-Station Power for Cotton Mills in Georgia.

The recent completion of the big hydroelectric development at Stevens Creek, on the Savannah River, near Augusta, Ga., is being followed by the use of the electricity for power by many manufacturing plants in that section. This waterpower plant is owned by the Georgia-Carolina Power Company of Augusta and will transmit 30,000 electrical horsepower. The Graniteville Manufacturing Company, with mills at Graniteville, S. C., is one of the cotton manufacturing plants that will adopt the electric drive. Two other companies that will use the Stevens Creek electricity are the Aiken Manufacturing Company and the Seminole Manufacturing Company, with mills at Bath and Clearwater, S. C. These companies have contracted for 1,600 electrical horsepower.

Electric Sign Data

Convention of Sign Manufacturers in Chicago.

As mentioned on another page of this issue a representative gathering of the electric sign and accessory manufacturers of the United States gathered in Chicago on March 30 and 31 for a two-day meeting for the purpose of organizing a permanent association. Preliminary action in this respect was taken at the initial meeting held in Chicago on December 1, at which an Organization Committee was appointed to perfect plans for a permanent association. This committee was composed of George R. Hall, H. I. Markham and Norman B. Hickox.

The need of an association of sign manufacturers was generally conceded by those actually present and by expressions from a large number of companies who found it impossible to be represented at the Chicago meeting. The misapplication of sketches by sign manufacturers and central-station salesmen seems to be one of the annoying conditions in the industry. Improvement of the quality of sign construction also seems to be the aim of those manufacturers represented and in the Constitution and by-laws adopted at the meeting strict requirements in this respect were made for membership.

At the session on Monday afternoon James Betts, of Betts & Betts, New York, read a communication from Dana Pierce, of the Underwriters' Laboratories, in which he pointed out the many ways in which the proposed association of sign manufacturers could cooperate with the Underwriters in reducing both the fire and accident hazard. There was also a great opportunity to obtain uniform inspection laws in different localities through organized effort.

A. R. Small, of the Underwriters' Laboratories, Chicago, delivered a brief address in which he called attention to the National Electrical Code and pointed out that the sign manufacturers either as an association or as individuals have the opportunity to modify or amplify the Code as respects the manufacture or installation of electric signs. He stated that in a great many instances particularly in smaller towns and cities the municipal electrical inspection departments use the Code as their standard for inspection and if the sign manufacturers could see that the proper requirements are embodied in the Code the standard of sign construction would be improved and no inspection difficulties would be encountered. In conclusion he referred to the label system as applied to sign manufacturing and enumerated the benefits to be derived therefrom.

J. E. Latta, also of the Underwriters' Laboratories, stated that letters had recently been sent to 150 municipal electrical inspection departments asking whether or not Rule 83 of the Code was applied in sign inspection. So far 54 replies had been received from 28 states and in only a few cases are changes or additions to this rule made.

Practically the entire time of the convention was taken up with a detailed consideration of the constitution and by-laws for the association, compiled by the committee previously referred to. Among the important committees provided for are the Grievance Committee, which will investigate and report on all differences between companies, particularly in connection with the misapplication of sketches; Manufacturing Standards Committee, which will seek to standardize manufacturing methods in sign factories; and the Underwriters' Standardization Committee, which will co-operate with the Underwriters' Laboratories.

Sign sketch submitted by the Greenwood Advertising Company, Knoxville, Tenn. This is a double face sign admirably suited for vaudeville and motion-picture theaters.

Sign measures 11 feet by 9.5 feet. There are 406 receptacles, 12 and 16-inch grooved, fancy block letters being used. The background is imported glass smalt and any desired colors can be furnished.

The clown's head is constructed under the Greenwood shadow-picture patents making several different expressions, among which are sleeping, winking eyes, smile, etc.

Electrical Construction

ELECTRICAL INSPECTION IN ONTARIO.[1]

By H. F. Strickland.

In a limited time it is impossible to go thoroughly into all the details of such an extensive question as electrical inspection of a province the size of Ontario. I will therefore confine my remarks to a short, comprehensive outline of the plan of inspection and the probable method of enforcing it.

We all know that it is necessary to first of all formulate proper laws and ones which can be regarded by those who know as just and practical, and then when the law is passed it is of little or no use unless it is enforced. In the case of the old inspection there is not very much the matter with the rules, or what we might term the old law. The chief weakness with these old rules is the fact that they do not specifically cover the life hazard. The old rules were made almost entirely under the supervision of the fire underwriters and kindred associations, whose one interest is the prevention of loss from fire, and I think that we can safely say that the National Electrical Code has been a familiar figure in the electrical field over this entire continent and that there was little wanting in it so far as was required to get a pretty satisfactory job, if carried out to the letter. So much for the departed friend. We always like to speak well of those who have gone before, and I think I am not going too far when I say that the book of regulations now produced by the Hydro-Electric Power Commission will be the recognized standard of electrical installation work in this province for a good many years to come, with of course such amendments and additions as may be necessary from time to time owing to fluctuations in the conditions. At this point it would be well to remark that the National Code when it first appeared was not anything like what it is at the present time. The Hydro-Electric Power Commission's Rules as they stand today have adopted a good deal of the matter originally in the National Code, for the simple reason that after having made a most exhaustive inquiry the Commission decided that there was nothing which would suit local conditions better than the main substance of this code. The text of the Code was carefully read through and re-edited, making considerable change in the phraseology of certain rules, eliminating a great many repetitions, adding a number of other rules and deleting a few unnecessary ones, and finally the whole substance of the book was reclassified and put in much simpler and practical order. The National Code was written in the form of a suggestion throughout, owing to the fact that the fire underwriters have had no legal power of enforcing their requirements other than by an increase of insurance rates, which often were detrimental to the interest of the companies bidding for insurance business.

As the Hydro-Electric Power Commission's Rules have become a law in the province, it was necessary that the book be re-edited in such a way as to make all requirements positive, clear and concise, which I think is conceded by most people who have studied it carefully to be the case. The question of enforcement is now the next problem to deal with. The law requires that municipalities must appoint electrical inspectors, and also has vested the Commission with power to approve of the selection which any municipality may make. I am not at the present time at liberty to make any statements as to what the Commission may do or what further legislation it may ask for, but I have reason to believe that as time goes on it will continue to add such amendments to the Act as to obtain the best results. In the meantime the municipalities have been notified throughout this province that they are expected to pass the by-law giving their municipality the power to regulate electric wiring and the use of electric current within their boundaries. The Commission has prepared a uniform by-law which has been printed and is sent to all municipalities, which they can copy and pass, thereby relieving them of much loss of time, expense and worry in drawing up a varied assortment of by-laws throughout the province, some of which might be useful and others perhaps useless. The Commission has power to amend this by-law, add to it or change it, as the commissioners may consider advisable.

In a great many of the important cities in Ontario the by-law has been passed and electrical inspectors appointed, and results are already forthcoming, so that it is likely before the end of the year there will be in the neighborhood of 100 municipalities from Ottawa to Fort William carrying on a municipal system of electrical inspection. The work of the different inspectors throughout the province is subject to the supervision of the Hydro-Electric Power Commission, that part of the work directly connected with electrical inspection being handled by what is known as the Rules and Regulation Department, but, like all other departments in the Commission, is subject to the authority of the chief engineer of the Hydro-Electric Power Commission. The result of this system should ultimately be very satisfactory to all parties concerned, inasmuch as the system of inspection, the enforcement of rules, the general interpretation thereof and the final settlement of all disputes will be uniform, as they must ultimately resolve back to the Hydro-Electric Power Commission for adjustment. One of the chief difficulties experienced in the country to the south of us is that while they have many municipal inspection bureaus, the interpretation and enforcement of the rules is largely affected by the idiosyncrasies of individual inspectors, resulting often in confusion and a duplication of devices to suit the whims and peculiarities of any particular inspector who may fancy that he is divinely inspired to enforce the rules just a little differently than somebody else. In the province of Ontario, however, the chief inspector does not make any claims to any superior inspiration, but will carry out the orders of his employers to the effect that the rules be enforced in their full broad meaning, that everybody get an absolutely fair and unprejudiced decision and that cheap substitutes for approved material and workmanship be not tolerated. In a word, the entire system of inspection is therefore under the control of one final authority, namely, the Hydro-Electric Power Commission, resulting in a uniform and legal administration of electrical inspection laws. Now in anticipation, this condition is ideal, and I hope before long that the realization of it will be all that can be expected.

1. Address at a local meeting of Jovians in Toronto, Canada.

We all appreciate the difficulties which confront the electrical contracting interests, which are, that people who are endeavoring to carry on a first-class business and handle only approved material are confronted with competition from irresponsible amateurs who under the present dispensation are able to do anything they like. This fact is well known to all people engaged in the electrical business as either contractor or jobber, without any further elaboration. Already old-Code rubber-covered wire is becoming a drug on the market, and in several municipalities connection has been refused to installations by local inspectors where old-Code wire had been used. This may seem a trifle hard at the first, but the contractors had been fairly warned that new-Code wire only would be accepted, and if they choose to play with fire they will get their fingers burned.

The new regulations of the Power Commission, in addition to the rules pertaining to the fire hazard, contain also sufficient extra safeguards to prevent, as far as reasonable, electric shocks or danger to the unskilled person who is inadvertently brought in contact with electrical apparatus or fittings. Voluminous productions have been produced and many hours of thought expended on fuses, and the fusing of circuits, so that they cannot be improperly or over-fused. The result of all this deliberation has been the production of cartridge fuses with different types of holders, with the object of making them non-interchangeable, but after all is said and done there is no rule heretofore to prevent anyone from fusing up his main cutouts with gas pipe or overfusing it beyond the melting point of the wires they are intended to protect, regardless of the consequences. Under the Hydro-Commission regulations, all main fuses must be inclosed in a sealed-up metal inclosure and proper warning placed on the box that if these main fuses are tampered with or the seal broken the offending parties will be prosecuted. I think I am pretty safe in saying they will be prosecuted. This at least insures that the installation will be protected so far as the main fuses are concerned, and if amateurs or others choose to overfuse their branch circuits they can only go so far and no further. There is nothing in the rules to prevent the consumer from having an auxiliary main fuse if he desires it, but he will soon learn to know that once he goes past the safety point he will blow his main fuses, and it will likely cost him something to have it replaced.

There is one point in connection with the whole of the electrical inspection methods which is of the utmost importance and one which I wish at this juncture to emphasize very strongly, and that is the prevailing notion among a great many electrical contractors, and also an impression which a great many of these people give their customers, and that is that the new regulations will greatly increase the cost of electric wiring. I wish to bring out this point very strongly, because it is one of great importance to central-station operators. In answer to this I would quote the statement of one of our best known central-station operators in Canada, who in writing to us recently used the remark that "even should proper regulations somewhat increase the cost of electric wiring, I am firmly of the opinion that it should be safe at any cost." When this statement is thoroughly digested the force of it becomes more and more apparent. When one is called upon to enter the home of some unfortunate family whose husband and father has been suddenly carried out from their very midst in the prime of life through an unfortunate accident owing to defective electrical installation, the truth of this statement is brought home in a most forcible and grievous manner. I have now been in three homes during the past twelve months where just such an accident has occurred, and in each case the electric wiring was defective and could have been originally installed properly for practically nothing more in the way of expense than was expended in doing work in the way in which I found it.

The object of the wiring rules and regulations is to ensure to the unskilled and untrained people of the community a reasonable protection against shock and fire and also to encourage skilled and *bona fide* electrical workers to give an estimate on doing work in accordance with the specifications laid down in the Hydro Rules and Regulations, knowing their trade will not be interfered with by the work of unskilled people who in the absence of any proper system of inspection are at liberty to do pretty much as they like. I want to say also at this juncture that wiring contractors who make the cry to their customers that the wiring regulations are greatly increasing the cost of wiring are only admitting that they have heretofore been giving their customers small measure for value received. To prove this statement it is only necessary to mention that there is little or nothing in our regulations requiring any greater expenditure of time and material than was originally suggested in the rules of the National Electrical Code. The chief difficulty is that in one case our regulations will require that the work be done in accordance with the letter, whereas before there was no way of enforcing the requirements except in a few centers where there was some inspection by the fire underwriters.

As a further illustration of this argument we will take the case of a moderate-sized home, say a ten-room house. To wire a house of this size with knob-and-tube wiring with an ordinary outfit of switches and the number of outlets which would be ordinarily found in a moderate-sized home would cost between $60 and $85, varying somewhat according to whether the switches were flush or surface, etc. Taking $75 as a fair price, it will cost just about 75 cents more to do this job in accordance with our Rules and Regulations as against the National Code requirements. Is there any man among you who would grudge 75 cents to save his wife from shock, fire or even injury? Yet in the face of these facts we have already had some contractors, where electrical inspection is being rigidly enforced, raising the cry that it is greatly increasing the cost of wiring. Their chief object in view seems to have no other motive than to make the system of inspection unpopular and to get back at the inspector. There is an element of inconsistency through all this. On every hand the cry goes up amongst the electrical contractors for good inspection. I therefore say to all those engaged in the business, chiefly in the outlying towns, now that we are giving you this inspection, do not encourage such talk, and let the municipal councils of your municipalities feel that the institution of a system of electrical inspection is for the welfare of the citizens at large.

Laws for Licensing Electrical Contractors.

The Committee on Legislation of the National Electrical Contractors' Association, of which P. H. Jaehnig is chairman, has made a report covering the laws and city ordinances now in effect in the United States, which affect the licensing or registration of electrical contractors. From this report the following paragraphs are taken.

Not all existing laws and ordinances are working out satisfactorily, due partly to defects in the law, and partly to laxity in its enforcement. There remains much to be done to secure ideal legislation. Each new law or ordinance proposed approaches more nearly the ideal, by eliminating such clauses as experience has proven to be unsatisfactory, retaining those which are beneficial, and adding new clauses which tend to place the business on a higher plane, or perhaps meet local conditions.

In introducing new legislation, the committee suggests the co-operation of all the electrical interests, principally the lighting company, the labor organ-

izations, the municipal and underwriters' inspection bureaus, manufacturers, jobbers, electrical engineers, architects and in fact all who are directly or indirectly interested in safe electrical work.

The law should be drawn so that it is a protection to life and property. It should not create a monopoly for the electrical contractor, or restrict the freedom of those who wish to engage in the business.

Make sure that it is constitutional.

Make the license fee small, and provide for a competent examining board.

Make violations of the law a misdemeanor. Educate the public and legislators as to the necessity and justice of the law, and the protection it affords.

Dignify the business by having it legally recognized, and the term "electrical contractor" will carry with it the prestige it deserves to carry.

Do not provide for a bond in the law; the penalty is enough to safeguard the public.

Provide that the license shall be revocable after repeated violations.

Do not license the workmen; the responsibility should rest entirely with the master electrician.

The licensing of electrical contractors is at present receiving much attention throughout our country, as it seems to be the only solution of certain abuses and weaknesses in the trade. One of the chief difficulties in obtaining uniformly good results in electrical construction work, is the irresponsible contractor, one who has just sufficient knowledge of the business to be dangerous. He, through lack of knowledge of correct principles, the use of inferior material and poor workmanship, tends to create a life and fire hazard, instead of a safe installation.

This has a tendency to discredit the business in general, and more particularly the legitimate and well qualified contractor, who strives always to install his work in accordance with correct principles, and the most modern practice, and produce a safe and creditable installation.

A license in itself would not be an assurance of safe or honest work but merely that the licensee is in a degree competent to engage in the work.

It would prevent those from engaging in the business who do not possess the requisite knowledge of the correct principles and their practical application.

The authority to issue a license carries with it the power to revoke it for improper practices, and violations of its provisions, and herein lies its power.

The cancellation of a license, for cause, would be more effective than the fear of a suit under a bond.

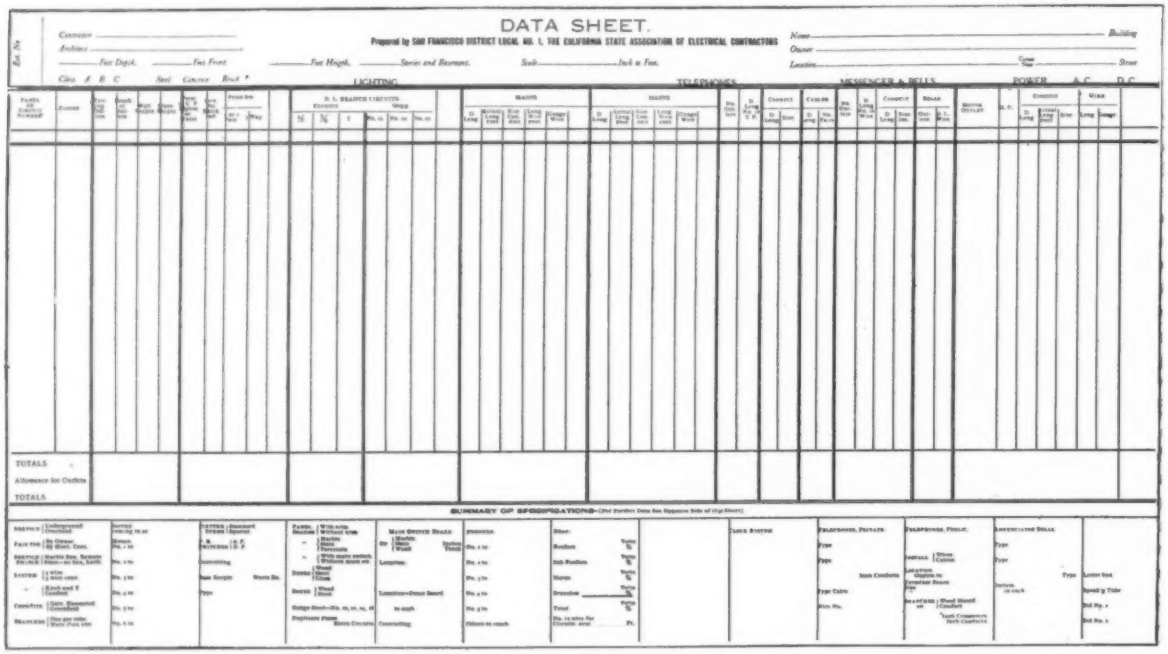
Licensing tends to dignify the business, give it official recognition, and place it on a higher plane in the minds of the public. It tends to fix responsibility, and guarantee a compliance with National Electrical Code requirements.

There are at present license laws in Tennessee, Louisiana, Maryland, Minnesota, Ohio and the District of Columbia.

In general these laws provide for a license to do electrical work, which can be secured by passing an examination before an examining board, the payment of a license fee and yearly renewal fee. In three of the states named a bond is required, the amount of the bond being $1,000 in Maryland and $2,500 in both Tennessee and Louisiana.

License laws are now before the legislatures of the States of Oregon, California, Indiana and Massachusetts, and electrical contractors in these states are very actively engaged in securing their passage.

The Ohio law, recently enacted, has a rather unique history. For the past eight years the Ohio electrical contractors have tried to have a law enacted licensing them, but without success. Last year a bill was presented licens-


DATA SHEET.

Prepared by SAN FRANCISCO DISTRICT LOCAL NO. 1, THE CALIFORNIA STATE ASSOCIATION OF ELECTRICAL CONTRACTORS

Fig. 1.—Data Sheet Prepared by San Francisco Contractors.

ing house movers, plumbers, sewer tappers and vault cleaners, and at the eleventh hour the contractors slipped in a rider in the form of the term "electrical contractor," so they were included in the license bill.

While perhaps this law did not give the Ohio contractors all they had hoped for, it is at least a step in the right direction, a legal recognition of the business of electrical contracting.

The Louisiana law was declared unconstitutional on the ground that it discriminated in favor of the public service companies, or was class legislation.

The Maryland law is not entirely satisfactory, due principally to lack of proper application and enforcement.

In the cities of the United States there are ordinances governing the installation of electrical work as follows:

Moline, Rock Island, Peoria and Chicago, Ill.; Newark and Camden, N. J.; Kansas City, Mo.; San Francisco and San Diego, Cal.; Toledo, O.; Minneapolis, Minn.; Louisville, Ky.; Denver, Colo.; Medford, Mass.; Madison, Wis.; Indianapolis, Ind.; New Haven, Conn.; Jamestown, N. Y.; Sioux City, Iowa; Memphis, Tenn., and Little Rock, Ark.

Proposed ordinances are being considered in the cities of Gary, Ind.; Watertown and Buffalo, N. Y.; New Orleans, La., and Newark, N. J.

The recent Chicago ordinance is not satisfactory as it does not provide for an examination, and anyone can secure a license by paying the required fee, and being vouched for by two citizens. Under this ordinance they have issued licenses to sign manufacturers, real-estate dealers, piano manufacturers, hardware dealers, plumbers, etc.

Sioux City reports that its ordinance is working nicely. Jamestown reports the ordinance and its provisions satisfactory, but its enforcement weak. Peoria reports the ordinance satisfactory. Denver has a very complete ordinance which is working out satisfactorily, although there is trouble in enforcing all of its provisions.

Kansas City reports the ordinance not working to suit the contractor. It does not provide for an examining board, hence anyone can secure a license by paying the fees. The fees are too high.

Camden and Newark report their ordinances are working out satisfactorily, although experience has shown where improvements can be made.

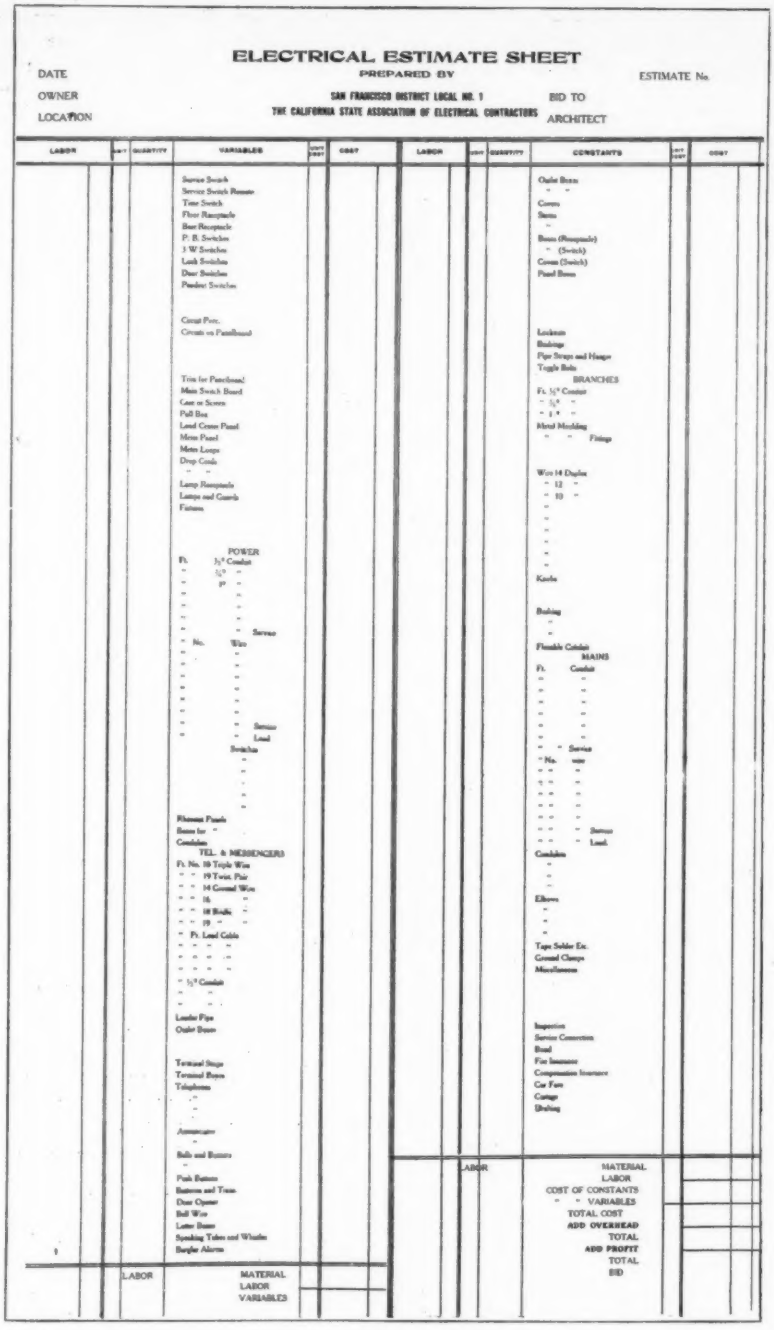
Searching for a Malicious "Inspector."

Electrical contractors of Kansas City, Mo., are co-operating with the police in searching for a bogus contractor who, it is alleged, has been cutting wires on one visit and repairing them on the next, thus creating profitable activity for himself. The initial visit is made, it is said, under the representation that he is an inspector.

Data and Estimate Sheets.

Printed blanks for facilitating the work of making estimates upon jobs of electrical contracting have been prepared and published by San Francisco District Local No. 1 of the California State Association of Electrical Contractors. These sheets are reproduced in the accompanying illustrations, Figs. 1 and 2. Each sheet measures 18.75 by 10.25 inches.

Fig. 1 is a data sheet which is filled out by reference to plans and specifications which are supplied to the bidder. Spaces are provided for each circuit involved and for all of the material


ELECTRICAL ESTIMATE SHEET

PREPARED BY

DATE

OWNER

LOCATION

ESTIMATE No.

BID TO

ARCHITECT

SAN FRANCISCO DISTRICT LOCAL NO. 1
THE CALIFORNIA STATE ASSOCIATION OF ELECTRICAL CONTRACTORS

LABOR | UNIT | QUANTITY | VARIABLES | UNIT COST | COST

POWER

TEL. & MESSENGERS

LABOR

MATERIAL
LABOR
VARIABLES

LABOR | UNIT | QUANTITY | CONSTANTS | UNIT COST | COST

BRANCHES

MAINS

LABOR

MATERIAL
LABOR
COST OF CONSTANTS
" " VARIABLES
TOTAL COST
ADD OVERHEAD
TOTAL
ADD PROFIT
TOTAL
BID

Fig. 2.—Estimate Sheet.

to be used in connection therewith, and for showing the kind and quantity of this material. After this information has been taken from the plans and specifications the estimate sheet shown in Fig. 2 is filled out. This is arranged so that the quantity and cost of material of all kinds can be filled in and also an estimate of the labor involved in this work and cost for same. There is also a place for incidental expenses connected with the work such as inspection, insurance, drafting, etc. After summing up the cost for material and labor, there are blanks which remind the bidder to make provision for overhead expenses and profit.

It will be noted that these forms are very complete and they are being found very useful by the California contractors. They may be obtained from W. S. Hanbridge, secretary of the Association, Rialto Building, San Francisco, Cal. They are supplied in sets of 100 sheets of each kind for $2.50.

LETTER TO THE EDITOR.

Keeping Costs for the Electrical Contractor.

To the Editor:

The term "electrical contractor" may be taken to mean anything from a man who keeps a small supply of wire and porcelain for doing small house jobs to one who installs entire lighting plants and extensive equipments. The former calls himself such so as to appear of more consequence. While much has been said about the "curbstoner" he seems to have made a place for himself in the industry. He can do work and bring modern conveniences within the means of people who would not otherwise be able to enjoy them at the prices the legitimate contractor has to charge, with his larger expense, and we must recognize the smaller fellow; and if the industry as a whole is going to expand, must have the co-operation of everyone in it. The records of the supply dealers will show that a large percentage of their business is with just these small wiremen, and instead of trying to wipe out this little fellow we should try and help him build up a bigger business and instill a few business principles into his mind so that he will realize that he must get a profit from his work if he is going to stay at the trade. As a matter of fact, if we were to go back and see the beginning we would find that many of the present big contractors, the "old-timers," started at one time with a small stock of goods and more ambition and nerve than capital. So, then, we must educate these men, who in many cases are excellent workmen, but who have no idea of what profit means and to whom everything over their cost appears as profit. It is true that they have not the expense the larger contractor has, but considering the smaller volume of business done they must get a correspondingly larger profit. They should also take into consideration the lost time, for as a rule they have not enough work to keep going steady, and often must spend some time soliciting work and also on figuring jobs which they do not always get, which is an item of expense. It will pay any small contractor to spend some time on his books and with a small business, keeping cost is a comparatively simple matter as there is not the great volume of this to do and if every contractor small or large would spend a little time each day on figuring out his cost on work done, there would be fewer "electrical firms" listed in the failures of the commercial reports.

Prices for wiring are strictly governed by competitive conditions. The customer has no idea of value pertaining to our goods except by comparison and when he gets one price from one man and another from another man it naturally leaves him to suppose that the higher-priced man is making more profit, while in fact they may both be losing money should either get the job, and the customer is not slow to recognize the ease with which he can "jockey" two bidders by telling each one he is high man and thus get one cut after another until the price of the job is down where no one could do it and hope to come out. If the bidders would just stop and consider what they are doing, they might better sell out and start a grocery store. Price cutting not only is demoralizing at the time it is done, but sets a precedent from which the one who gets the job at that time, or the next bidder, must suffer, as the customer thus gets a line on prices which he expects will hold good for future jobs. The writer gets up against just this proposition every day, where the prospective customer will cite other cases where a job was done so much cheaper and it is always hard to explain and at the best leaves the customer in a doubtful state of mind.

There are two ways of meeting competition; one is to get the job no matter what the consequences are and in due time have the sheriff put a padlock on your door; another is to get your price or leave the job to the other fellow and while he is busy trying to "come out" on a bunch of this class of work, you can be doing a lot of "time and material" jobs for your regular customers and get a profit from your work and I'll gamble that inside of a year you will be riding around on your jobs with an automobile while your competitor will be sitting up nights figuring out a new scheme for raising money to pay his bills with, if he has not "stung" his dealers he buys from already by this time.

The first essential thing necessary to attain success in any venture is to ever keep in mind what the deal is going to net you. You may need some advertising but you had better get that in some commercial form and not by taking a job below cost, which is the most expensive kind of advertising I know of, and remember that in handling work taken without profit you lose both ways; you are spending your time, which might otherwise be devoted to profitable work, on work which is causing you loss, besides the loss on the job itself. By keeping a careful and accurate record of your costs you can determine your future policy and then make up your mind not to take any job that you know will not net you a profit. If you only do one-half the amount of work, better lay off and go fishing and get some enjoyment out of life than to be overworking yourself on unprofitable work. I have heard the argument that it is impossible to keep an accurate record of costs and thus it is useless to try to keep any at all. Reasoning along these same lines, we are wasting our time trying to get along with artificial light as we cannot light the earth with it and thus might as well not have any at all. The argument is about as logical, if you cannot keep accurate records, keep them as accurate as you can and get a rough idea of your cost until you can formulate some plan to do better. We have changed from one plan to another in our shop for keeping various records and will change any time we find a better way than we are using at present. Only by improving your methods of handling your business and your jobs to keep pace with the times can you hope for success. Do not make the mistake of thinking you are independent of your competitor for you are not and never will be so long as you are not alone in your line of work and must stand or fall with him under the conditions outlined above.

E. M. Raetz.

Rochester, Minn., March 23, 1914.

Electric Clearing House of Louisville.

A number of Louisville, Ky., electrical contractors and other members of the electrical trades have organized the Electric Clearing House of Louisville. C. C. Childers, of the Childers & Waters Company, is president, and E. C. Knoop, one of the electrical inspectors of the Kentucky Actuarial Bureau, is secretary. An interesting feature of the meetings of the organization will be informal talks by and discussions with the electrical inspectors of the underwriting agencies, who will point out better methods of handling work with reference to fire protection.

Double Lighting Systems Proposed for Kansas City.

An Ordinance is pending in the City Council of Kansas City, Mo., providing for the installation of double lighting systems in all theaters, apartments more than two stories high, and other buildings more than two stories high used for business, to which people are invited, or in which 30 or more persons are employed. One set of lights shall be kept burning when natural light in sufficient quantities is not available, and the other shall be kept ready for instant use.

Los Angeles Electrical Department Enlarged.

The bureau of Fire Alarm and Police Telegraph has been incorporated in the Department of Electricity of Los Angeles, Cal.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, Vice-President, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Engle, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Harman, O. E. Smith, New York City.

MEMBERS AT LARGE:
George L. Collison, James B. McCarthy, Frank R. Daniel, Thomas D. McColl, James H. Fenton, C. W. Mitchell, F. G. Hartwell, A. A. Moffitt, J. E. Latta, R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary has received word that the New York Section has chosen its officers as follows: president, J. C. Forsyth, chief inspector of the Electrical Department, Bureau of Surveys, New York Board of Fire Underwriters, 123 William Street; vice-president, A. L. Holt, 19 West Eighty-fourth Street; secretary and treasurer, C. A. Hannan, Little Neck, Long Island; delegates on the Executive Committee, National Association Electrical Inspectors, C. A. Hannan and O. E. Smith, Box 180, Edgewater, N. J.

Members will please observe that by error, the Secretary gave Mr. Hannan's name wrongly as Harman both in his recent circular to the Executive Committee and to the printer for the heading of this page in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

C. B. Roulet, who is a past president of the Association (1905), has removed from Dallas, Tex., and is now employed in the Special Risks Department of the National Fire Insurance Company, his home address being 138 Whitney Street, Hartford, Conn.

The Secretary desires to say a few words in regard to his message which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of March 21, especially as it has been called to his attention that some persons inferred there was a difference of opinion between him and the President on the subject there discussed.

In the first place the Secretary intended that the matter there printed should appear over his personal signature, and not as a message in order to prevent any idea that he was stating the views of the Association, and not his own personally. If anything is to be printed as the Association's views it must be formally presented to the Executive Committee and acted upon; and unless announcement that this has been done is made in print, the matter printed is invariably to be understood as personal with the author. I should be sorry indeed if anyone understood anything else as regards my article of March 21.

My purpose in writing it was first to express my emphatic belief in the correctness of President Day's position of "Let the Code Decide"; and second, my absolute adherence to his policy of ruling out of order any and all attempts to get the Association on record *publicly* regarding the Code or related matters, except when the proposal for such changes has been placed before us by the Secretary of the Electrical Committee in proper form in order that after discussion we may, if it seems best, *instruct* our representative upon the Committee.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

This does not mean that the Association does not propose to take an active and legitimate part in the revision of the Code. Thus, four matters at least have recently come up from sections and other sources in which we have thought it worth while to take action. These matters were simply presented in writing to Representative Cole by the Secretary with the request he present them to the Electrical Committee at its meeting in Boston this month, and have them referred to the proper subcommittees and presented in proper form for public discussion and action at the meeting for revision in New York next year.

It does mean, I believe, that in every jurisdiction, insurance, public service or municipal, when a Code has been adopted by the proper tribunal in that jurisdiction, it is to be the final authority for the action of each of our members. In all cases it should be interpreted equitably and reasonably by both parties and in case of controversy, the points at issue should be promptly referred to the proper superior arbiter in case no agreement can be reached after a cool study of the Code.

I presume the idea of disagreement arose from my attempt to elucidate the different position of the several types of inspection departments and their relations to the community under the law.

We all know that there is a difference. The inspector for the insurance company derives all his rights and powers under the *contractual relation* existing between his company and the policy holder and the moment he steps beyond that, he is without power to enforce a demand because he can only do so through the policy,—by suspension of insurance, by nonpayment in case of loss, or for similar reasons, which if they come to a Court, appeal can only be maintained by the aid of the contracts and mutual agreements between the two parties. The municipal inspector derives his rights and powers from the statutory law and municipal bylaws consonant therewith, under the police power of the commonwealth which is a totally different thing. Moreover he is required implicitly, if not explicitly, in every case to consider life and health not only as each citizen's acts affects himself, but also as they affect his cocitizens.

We observe the influence of the appreciation of this point in the Code which Wisconsin is considering at this very time.

It is probable that in the large majority of moderate-size communities, the National Electrical Code as it stands is entirely sufficient to guard the people from

bodily ill as completely as from property loss. But it is a fact that as the community increases in size, so does the complexity of the interrelations between the several individual parts, and it cannot be expected that the above statement will hold *without limit*. It may well be our ideal to develop a Code which shall be so comprehensive and flexible as to protect without change the city of a million and the hamlet of five hundred, not only on the fire side, but on that of health and life as well. But I must confess that it seems to me that if such a Code *could* be worked out it would necessarily be so full of special provisions, exemptions, and additional requirements, that we should be just as badly off, if not worse than with a simpler Code modified in a small number of points (and if necessary printed like New York's, showing the Code reading and the change) to suit the comparatively moderate number of localities where change is really desirable and necessary.

Let me illustrate with just one case. Take the former Code, with its permissive secondary grounding. Suppose I had let the Code stand that way and that the supply company had chosen not to ground. A citizen meets with an accident through disturbance of his house system and someone tells him that if it had been grounded it would not have happened. He sues the supply company and the municipality and me as its duly authorized agent for permitting the company to continue its practice. It would be out of the question for me to testify that the Code I had adopted permitted the alternative, the plaintiff's attorney would observe that the law made me, in the municipality, the sole judge of safe wiring (as it does) and gave me the use of its weapons to enforce my ruling; he would instantly ask on cross-examination if I believed the practice I permitted was the best available in the present state of the art to protect his client. I should either answer, "Yes," in which case the way would be open for him to discredit me by expert authority, or, "No." In either case the result would probably be that the court would order a verdict immediately, or take some action toward the same end according to the rules of procedure. The municipality would lose, and personally I should much prefer to have modified the Code in that point (as I did by changing "may" to "must") than to have to face the Board of Selectmen at their next meeting.

It seems to me, and please understand that I am expressing *my personal views* throughout, that we must either develop a Code as full and effective to protect against risk to life and health as against risk to property by fire, by the joint harmonious action of all parties at interest; or we must be prepared to see a life and health Code developed by the states (of which the Wisconsin plan will be merely the germ) which I fear, like so many other laws, would differ in the different states.

It may be better that two Codes should grow up side by side in harmony, and that we should develop something interstate (like the Negotiable Instrument Law) and have the states adopt it together with a purely fire protective code.

It does not seem as though this is necessary however, and I do not personally feel that it would be wise or justifiable.

The National Electrical Code is at present about as perfect a fire-protective Code as it is humanly possible to draw up, considering the state of the art and the rapid spread of the use of electricity from day to day. Moreover, it is a fact that the things which protect against fire are usually protective to life as well. It only requires a very moderate amount of work to make such rules equally as good for a life Code. I believe we should all aim toward that end and feel confident that we shall reach, if not the ideal of a Code absolutely without need of modification, at least as near that result as common sense appreciation of the complexity of modern society should lead us to anticipate, and human endeavor permit.

Grounding of Secondary Systems.

Question 259. Under the present Code rule for grounding secondary systems, is it permissible to ground at the transformer when the transformer feeds a number of services or must each individual service be grounded?

Answer 1 (U). Either at transformer or individual services as provided in rule 15*b*.

Answer 2 (W). The rule gives alternative permission, individual service grounding is preferable.

Answer 3 (A). The rule is alternative. But if transformers are overhead, each service should be grounded; if underground work is under discussion, ground at the transformer.

Answer 4 (H). I should say where a single transformer feeds a number of services distributed at any great distance from the transformer, each service should be grounded.

Answer 5 (P). Rule 15 permits the ground at the transformer; but it should be noted that if the secondary system is over 500 feet long, its neutral must be grounded every 500 feet.

Answer 6 (O). Grounding secondaries at the transformer is not only permissible, but is required if the secondaries are not grounded at the individual services, and in addition the neutral must be grounded every 500 feet.

The option provided is apt to prove valuable to the inspection department in case the lighting company refuses to ground its secondaries at the transformers. The inspector frequently has no jurisdiction over the wires in the street, but may insist that each building connected to the secondary shall have a ground on its service.

Answer 7 (E). This question is definitely answered in rule 15*b3*. The ground connection may be at the transformer or on the individual service, but when the transformers feed systems with a neutral, the neutral must also be grounded at least every 500 feet. If the line be not 500 feet long in a three-wire system, then the ground at the transformer would be sufficient.

Answer 8 (Q). It is alternative. Ground connection ought to be at the transformer. When transformer supplies a number of services, neutral wire must be grounded every 500 feet.

Answer 9 (T). Yes, certainly following the requirements of rule 15*b3* and *c* to *g* inclusive.

Answer 10 (J). The ground connection must be at the transformer or on the individual service, rule 15*b3*. Either is permissible and there is no distinction as to whether the transformer supplies only one service or several. Note, however, that the neutral wire must be grounded every 500 feet.

Answer 11 (D). Rule 15 for grounding, requires same to be done at transformers and every 500 feet along the line.

Answer 12 (S). By Rule 15*b3* either method is allowed and acceptable.

Answer 13 (B). As may be seen by paragraph *3* section *b* of rule 15 relating to the grounding of low potential circuits, the ground connection may be made at the transformer or on the individual service as provided in sections *c* to *g*. Where system is an overhead one, the neutral wire should also be grounded at least every 500 feet. In this city, while the method as above outlined would be permissible, each and every service entering a building is grounded to the service side of the water shut-off on water service entering the building.

Answer 14 (M). Rule 15*b3* states that the ground must be at the transformer *or* on the individual service. No limit is placed on the number of these which may be connected to one transformer, so each

service need not be grounded if the transformer is grounded properly.

Answer 15 (F). Yes.

Answer 16 (L). By rule 15*b*3 (also *c* to *g*) a choice of methods is permitted, and this choice is perfectly clear.

Answer 17 (Y). Yes.

Answer 18 (N). Yes it is permissible. In this municipality transformers are grounded and also the neutral at *every alternate pole* (that is, every 200 to 250 feet). Further if a two-wire service feeds a number of farm buildings in the outskirts, one side of the service is similarly grounded. The water service cannot be used because there are some sections of the old cement-lined pipe laid in the 1870's still in use, which renders it ineffective as a whole. At the same time ground water is usually found not over 10 feet below surface even in dry seasons, nevertheless there are a number of localities where ledge, clay ridges, etc., intervene and at several of these points ground wires are carried over to maintain continuity.

Position of Signal Wires on Pole Lines.

Question 260. In a pole line of joint occupancy, carrying telephone, telegraph, electric-light and power, and fire-alarm wires upon it, which is the proper position for the fire-alarm wires—on the top or on a lower cross arm?

Answer 1 (U). All signal wires such as fire alarm should be on lower cross arm.

Answer 2 (W). Rule 85*b*, fine print note, says on lower or bottom cross arm.

Answer 3 (A). The old method of running municipal wires for fire-alarm and police service was at the top of the pole. This was before power wires were in use. At the present time, I believe the proper place for these wires is on the first cross arm from the ground.

Answer 4 (H). The practice varies in different places and possibly neither can be claimed as invariably the correct solution. If the fire-alarm and similar wires are at the top of the pole, inconvenience may be occasioned by the presence of heavier wires below it, should it become necessary to go over them to reach the alarm system. Further the fire-alarm wires being smaller are likely to breakage in severe weather and to injure the system by contact with higher potential wires below them. Still in this city the fire-alarm system still occupies the top of the pole and no difficulty is experienced.

Answer 5 (P). You will probably recall that many of the earlier electric-light franchises contained a stipulation which reserved the top arm for the use of the fire-alarm telegraph and other city wires. Formerly the controlling thought was that these wires should be placed as far as possible out of the reach of any disturbance due to the operations of other linemen. Later on, after a number of experiences with sleet storms, opinion changed and it was believed to be better engineering practice to install the lighter wires, which break the more readily, beneath the heavier or electric-light wires, which less seldom part under the weight of the sleet. Having arrived at the general conclusion that the signal wires should be placed below the electric-light wires, there was no objection to retaining the original practice of placing fire-alarm wires above other signal wires in order to minimize the chances of disturbance due to the operations of other linemen. Therefore, the upper one of the several signal cross arms seems to be the proper one to reserve for the fire-alarm telegraph. This is coming to be the general practice throughout the country, as in this way the wires will suffer as little disturbance as possible.

Answer 6 (O). This point is merely suggested under rule 85*b* of the Code, but see also rule 1*d*, National Board of Fire Underwriters Rules for Signaling Systems; also rule 3*c*, National Board of Fire Underwriters Rules for Municipal Fire-Alarm Systems. The signaling wires being smaller and more apt to break than the electric-light or power wires should be placed underneath. Following out this idea, I should judge that the best location would be under the electric-light wires and above the other signaling wires.

Answer 7 (E). The last sentence of rule 13*c* bears on this question where any part of the occupancy exceeds 5,000 volts. "If carried on the same pole with other wires the high pressure wires must be at least three feet above the other wires." Also rule 85*a* provides "and must not be placed on the same cross arm with electric light or power wires."

Answer 8 (Q). Lower cross arm.

Answer 9 (T). Lower arm, rule 85*b*, fine print clause.

Answer 10 (J). This question does not fall under the jurisdiction of this department.

Answer 11 (D). I think these wires are preferably installed on the top arm.

Answer 12 (S). On the lower cross arm. Rule 85*b*. I should consider the fire-alarm wires of the greatest importance and so should have the preference as to location.

Answer 13 (M). This condition should be avoided if possible. Rules for fire-alarm systems state that fire-alarm wires should preferably be run under the others. But to prevent injury by linemen working on poles, they are frequently run over the others. We consider this frequently "the lesser of the two evils."

Answer 14 (F). Bottom.

Answer 15 (N). The National Code (outside of rule 13*c* which merely touches the question by implication) contains merely the suggestion of the fine print note to rule 85*b*. According to the first paragraph of the page headed, "General Suggestions," such notes are "in no case to be considered by the inspection department as mandatory." This clearly indicates that Electrical Committee in March, 1913, was not prepared to say that the lower cross arm was invariably the better location and make suggestions accordingly a part of the Code. It is true that in the Rules for Signaling Systems, we find a rule reading, "Must be supported at least every 150 feet and as far as possible run under electric light and power wires." This is a part of the rule not a note, but two things should be noted, first that we are here concerned *only* with the National Electrical Code, and second that even the quotation above contains the intimation that sometimes an alternative may be necessary.

As a general thing, however, the fire alarm should be below the light and power wires, but above the telephone lines, etc.

One reason for this, which is not to be neglected in country towns with lines running long distances along the roads, is that the wires above exert a powerful and valuable screening action to protect the fire-alarm wires from the effects of lightening during the thunder-storm season; while at the same time the lines below shield them to some extent from the various missiles frequently thrown carelessly and sometimes wantonly at the lines by passers by.

Answer 16 (L). This is practically covered by rule 85*b*, fine print note.

Answer 17 (Y). This is to some extent a matter of opinion. In this territory the municipality uses the top arm.

Answer 18 (B). The subject matter of this question is particularly of great importance in connection with life hazard. It would be desirable from the standpoint of increased safety, both to life and property, if signaling wires, to which class fire-alarm, police-signal, telephone and telegraph wires belong, and the wires for electric-light, heat and power purposes were on separate lines of poles; wires of one class being on one

side of the street and wires of the other class being on the other side.

This, however, is impracticable to enforce in the majority of cases, it being necessary in many cases to attach both classes of wires to the same poles, particularly in cities, etc., where it is often *difficult* to get pole rights for one line of poles and *impossible* to get rights for two lines on the same street.

Under conditions where city and other signaling wires occupy the upper portion of poles, and the light and power wires are attached to cross arms beneath, it is necessary for the linemen who work on signaling wires to pass up between the wires carrying currents dangerous to life, which in my judgment subjects them to is an unnecessary hazard.

Furthermore, the relative strength of the two classes of wires is such that under the stress of severe storms the wires of the signaling class are more liable to break than those of the other class, and, falling, often come in contact with light and power wires attached to cross arms beneath, thereby becoming charged with currents dangerous to both life and property.

Our records show that the majority of accidents to persons on poles, and of fires due to crosses between signaling and high-potential overhead wires, have been mainly due to the unfortunate custom in the past of placing wires of the signaling class above the wires of the light and power systems.

Previous to 1910, the ordinances of this city reserved the upper cross arm and top of pole for the fire-alarm and other signaling wires of the city. Believing in the light of experience that this condition was wrong from every point of view, except possibly the point of view that wires at the top of the pole were not liable to injury when other wires were being attached below, the matter was taken up, by this department and its views presented in detail to the other departments of the city government with the result that the ordinances were changed so that at present it is the lower cross arm on pole which is reserved for city wires.

In such cases as where the telephone company desires to attach a cable to a joint pole, it is permitted by joint agreement, as the cases come up, that the cable may be attached to the lower cross arm, the city signaling wires taking the cross arm immediately above. This is permitted on account of the telephone company's running cables or ring construction which has a tendency to sag between poles, and which if placed immediately above the city wires, might in places sag down so as to come between city wires, with possible chances of trouble in times of storms.

We also insist in all cases of joint occupancy of poles, that the two classes of wires shall be distinctively separated by at least 40 inches between same.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

Court Decision. The federal court has handed down a decision enjoining the operation of the three-cent fare law in Arizona. The decision is based upon the opinion of the Supreme Court of Arizona in the Tuscon Gas and Electric Company case, wherein that court held that the sole power to fix rates for public service corporations, under the constitution, lay with the Corporation Commission of the State of Arizona and that the Legislature did not have concurrent power to establish such rates.

The Yuma Water & Electric Company applied to the Corporation Commission for authority to change its rates so as to provide a material reduction for small consumers and an increase for several of its large consumers.

CALIFORNIA.

Compensation for Taking of Utility's Property. The Railroad Commission fixed the value of the Eureka Water Company in condemnation proceedings. This is the first decision of the Commission under the amendment to the public utilities act empowering it to fix, on application of towns, cities, counties or municipal districts, the value of the public utility properties which the public seeks to acquire. The Commission states in this decision the elements to be considered in making such valuations.

INDIANA.

Proposed Merger. An application for authority to consolidate practically all the utilities at West Baden and French Lick under the name of the West Baden Water, Heat, Light & Power Company is under consideration by the Commission. The interested parties expect that the Commission will grant authority to merge, provided the companies surrender their franchises and take in lieu thereof an indeterminate permit. This the companies have agreed to do.

ILLINOIS.

General Order. The Commission has issued the following general conference ruling. "This Commission holds that any changes made by public utility in its rates, charges, and classifications for service since July 1, 1913, whereby the rates and charges exceed those in effect on said date, are illegal unless the same have been consented to by this Commission. If any change of rates and charges are deemed necessary application should be made to this Commission for its consent to make such change. And in case any public utility has made a change of its rates and charges whereby the same exceed those in force on July 1, 1913, such public utilities are ordered and directed to return to the rates and charges as of July 1, 1913, and to continue the same in force until this Commission has given its consent to change the same." An application for change in rates is to show the existing schedule and the schedule of proposed rates and charges. "Where the rates and charges of a public utility in effect on July 1, 1913, are discriminatory, such public utility must forthwith apply to this Commission for consent to change its schedule of rates and charges so as to comply with the law against discrimination in rates and charges."

The Mt. Auburn Telephone Company applied for authority to put in effect a new rate schedule providing higher rates for practically all classes of service. The applicant submitted a statement showing the purchase price paid by the present owner and the revenues and expenses of the plant. The decision states that the income derived from the proposed schedule "to take care of depreciation and dividends would not exceed 14.8 per cent of the original cost, and therefore could not be held excessive." The Commission further points out that the plant is very economically run. "An example of this is shown by the president's salary, which is $50 every three months. Surely, if the officers and managers

are willing to donate their services, the stockholders of the company are entitled to that donation as against the subscribers." The Commission approved the increase and the new rates are as follows: business—private line, per year $18.00, party line, per year $15.00; city residence—private line per year $15, party line per year $12.00; rural—per year $15.00 (discount of 20 per cent if paid quarterly in advance); and mutuals—switching $6.00.

Transmission Line Near Galesburg. The newly constructed transmission line of the Galesburg Railway & Light Company runs above and parallel to the trolley line of the Rock Island Southern Railroad Company and both lines cross the wires of the Bell Telephone Company. Upon complaint of the Rock Island Company, the Commission made an investigation and found that the rules of the Commission for the construction of such lines had not been complied with. The Galesburg Company was ordered to rebuild its line and the Rock Island Company was ordered to make certain changes in its line in accordance with the specifications contained in the order.

Springfield Gas & Electric Company. The Commission has approved the plans for the construction of the company's transmission line which crosses the tracks of the Wabash Railroad Company at Tenth Street in the City of Springfield and granted the company permission to maintain and operate such transmission line.

Free Service. In a recent decision the Commission has held that it is not against public policy to allow railroads and railways to issue free transportation to policemen of a city or village and United States mail carriers, to be used in the performance of their official duties.

Stockton Electric Company. The commission issued an order granting permission to the Stockton Electric Company to construct a power transmission line across the tracks of the Chicago Great Western Railroad Company at Stockton, Ill. The order gives directions as to the construction of the crossing.

MARYLAND.

The Consolidated Gas, Electric Light & Power Company has applied for permission to issue $1,106,800 of five-per-cent debenture stock, the proceeds to be used for construction purposes.

Proposed Legislation. The Maryland Commission asks that it be given the power to declare forfeit the charters of those public service corporations which refuse to obey the Commission's orders to render adequate service.

MASSACHUSETTS.

The Worcester Suburban Electric Company was authorized by the Gas and Electric Light Commission to issue 2,000 shares of new capital stock at $125 per share. The proceeds of 1,280 shares are to be applied to the payment of notes outstanding December 31, and 720 shares to the payment of the cost of additions made after that date.

Proposed Change in Commissions. Governor Walsh advocates the reduction of the Public Service Commission from five to three members, with salaries of $8,000 each, and the enlargement of the functions of the Gas and Electric Light Commissioners so as to include supervision of telegraph and telephone, water supply and water power companies, members of this board to have a salary of $8,000 each.

NEW JERSEY.

Extension of Service. The Board has rendered a decision in a case brought by residents of South Bound Brook to compel the Public Service Gas Company to extend its system along Canal Street, holding that an order to such effect cannot be granted unless the petitioners guarantee the company a return upon the necessary investment of eight per cent. Such return, estimated at $108.89, is to cover a period of income of five years.

OHIO.

The Dayton Power & Light Company has been authorized to issue $271,500 preferred cumulative stock to be sold for not less than 80 per cent of par. Before this issue can be placed on the market the company must retire $200,000 common stock.

WISCONSIN.

The Troy & Honey Creek Telephone Company was authorized to put in effect certain of the increases applied for in local and rural telephone rates. The Commission ordered a discontinuance of free service over more than one connecting line. The subscriber may choose one of four lines over which he is entitled to unlimited service and must pay an additional amount per month for unlimited service over each additional connecting line. Toll rates are provided for those not contracting for service over connecting lines. A rate tending to discourage the installation of the so-called silent phones was included in the schedule fixed by the Commission. The overloaded condition of the rural lines is to be rectified, and the increase in rates is not to be put into effect until the company installs a system of accounts approved by the Commission.

The Westboro Telephone Company was authorized to issue $2,500 of capital stock, the proceeds of which are to be used for the building of a telephone line in accordance with the provisions of a certificate of convenience and necessity issued by the Commission.

New England Central-Station Men Banqueted by General Electric Company.

At the twelfth annual banquet given by the General Electric Company to the representatives of central stations in New England, held March 27 at the Copley Plaza Hotel, Boston, E. W. Rice, of Schenectady, N. Y., president of the company, paid tribute to the memory of the late George Westinghouse, speaking of the courage and energy of the deceased.

"It may not be inappropriate," said Mr. Rice, "to speak of Mr. Westinghouse as the greatest competitor of the General Electric Company. The loss through his death is one that cannot fail to be felt with the deepest regret by the whole electrical industry."

J. W. Lieb, Jr., vice-president of the New York Edison Company, spoke on "Leonardo da Vinci, Engineer and Artist." C. B. Davis, manager of the Boston office, presided; 500 were present.

Reduction in Price of Tungsten Lamps.

Another reduction in the price of tungsten lamps was put into effect by the General Electric Company and its various lamp works on April 1, when the list price was reduced from about 10 to 15 per cent. Lamps from 10 to 60 watts, inclusive, have been cut 5 cents each; 100 and 150-watt lamps 10 cents each; 250-watt lamps were cut 20 cents. The new list prices are 30 cents for all lamps from 10 to 40 watts; 40 cents for 60 watts; 70 cents for 100 watts; $1.10 for 150 watts; $1.80 for 250 watts. These prices apply to 100 to 130-volt lamps in standard package quantities.

Proposed Reorganization of Memphis Telephone Company.

Application for a franchise for the Memphis Automatic Telephone Company has been made to the City Commission of Memphis, Tenn., by C. W. Thompson, J. B. Goodbar, T. R. Winfield, L. W. Johnson, George G. Alban and others. The company proposes to buy out the Memphis Telephone Company, reorganize under the name of the Memphis Automatic Telephone Company, with an authorized capitalization of $2,000,000, and to spend $500,000 in telephone extensions. The application asks a franchise for 30 years, at established rates to subscribers lower than the rates fixed by the city in its recent rate ordinance.

Symposium on Electrical Inspection.

At a joint meeting held in Chicago on March 26 by the Electrical Section of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers, the subject of electrical inspection formed the topic of the evening.

Inspection of Electrical Fittings.

B. H. Glover, electrical engineer, Underwriters' Laboratories, Chicago, opened the symposium by presenting a paper in which he discussed the inspection of electrical fittings and devices. This subject, Mr. Glover said, naturally suggests consideration of the National Electrical Code; unfortunately this is still regarded in many quarters as a code developed by the insurance interests. Mr. Glover showed that, although the drafting of the Code was started by insurance men, now it is truly a national code, in the drafting and revision of which substantially every electrical interest is represented. The continual changes in conditions and the improvements in electrical conconstruction methods and in appliances necessitate more or less frequent revision of the Code from time to time. During these revisions and, in fact, at all times the Code has been subject to criticism by all parties interested in electrical work; therefore it is undoubtedly the expression of the best judgment of the electrical industry. The Code is generally accepted throughout the country and even in Canada. In some cities its requirements are added to by special rules covering conditions peculiar to the community. However, it is interesting to note that all large cities are gradually dropping most of their special rules and making their entire set of rules practically coincide with the National Electrical Code.

Mr. Glover explained the work of the Underwriters' Laboratories, showing how manufacturers of all kinds of electrical fittings submit these for test and criticism before they are placed on the market. The investigation of these fittings is entirely impartial and concerns itself only with the question of whether these fittings comply fully with the Code. If such is the case, a recommendation for approval is made; if the fitting or appliance requires some changes in its design or construction to make it accord with the Code, recommendations are made to the manufacturer and, in practically all cases, he is glad to make the changes along these lines. When a suggestion for approval is made, this is usually ordered by a council and the fitting is then placed in the published list of approved electrical fittings. This list and the Code form the two essential handbooks of approved electrical construction.

Mr. Glover showed further that the list of approved fittings is a most valuable guide in the selection of material to be used in construction work. This list is entirely unbiased and gives an array of equipment which can be depended upon. He called attention to the hazards likely to arise when fittings that have not been approved are used. He explained further how close check is kept on the manufacturers to see that the fittings they make are maintained up to the standard of the samples that have been submitted for test and approved. This is done by a number of resident and traveling inspectors and by means of the label service, which is a most reliable way to insure that the product is up to standard. Inspectors in the field frequently make suggestions as to improvements of devices. Mr. Glover also showed that the safety idea has long been actively kept in mind, citing in this connection the standardization of lamp bases and sockets made at the suggestion of the Underwriters' Laboratories.

Municipal Electrical Inspection.

V. H. Tousley, chief electrical inspector of Chicago, took up the problem from the standpoint of the municipal inspector. He described at some length the organization and the work of the Electrical Inspection Bureau of Chicago. Electrical inspection work has been carried on in the city for over 30 years and therefore has kept closely in touch with the great developments of the electrical industry. Mr. Tousley referred to the first set of electrical rules which were drafted in Chicago in 1893; out of this later grew the National Electrical Code. From its early beginning the Bureau has steadily grown until now it has 71 employees, of whom 47 are inspectors. The appropriation for the Bureau for the year 1914 is close to $124,000. Mr. Tousley gave a number of interesting figures on the work conducted during the past year to show its magnitude and varied character.

As regards the classification of the city's electrical inspectors, the largest number of them are concerned with inspection of interior installations; for this purpose the city is divided into 27 districts. An application for an electrical installation in any district is given to the inspector assigned to the district, who follows it up during its various stages until the work is completed. A new division has been created covering all outside electrical lines, both overhead and underground; three inspectors devote themselves entirely to this work, of which a considerable portion has had to deal with a study of electrolysis of underground pipe and other systems from stray railway currents. Two inspectors devote their entire time to inspecting electric signs; this work has been continued for about 12 years. All signs are inspected when first put up and afterwards from time to time to make sure that they are properly maintained electrically and so as to prevent danger of falling. There are between 7,000 and 8,000 electric signs in Chicago. One inspector devotes himself to the inspection of the larger theaters and of theatrical equipment. He makes visits to all the theaters from time to time and also makes inspections of electrical equipment of traveling show companies; this latter equipment is usually in very poor order and must be put into proper condition before it can be used in any theater in the city. One inspector devotes himself entirely to moving-picture theaters; he is constantly going the rounds among these establishments, of which there are between 700 and 800 in the city. This work has been so systematized that the electrical equipment of these places is maintained in quite satisfactory condition.

About two years ago a municipal electrical laboratory was established, chiefly to make quick tests of rubber-covered wire and also of various materials which the inspectors suspect to be not up to standard. Mr. Tousley referred to finding a considerable amount of poor rubber-covered wire still in use and called attention to the hazard resulting from this. Last year there was established a division of reinspection in which seven inspectors are now devoting their entire time to carefully going over the electrical equipment in old buildings. This inspection is intended to minimize both the fire and life hazards. Although it is the aim to cover all buildings, at present the staff for this purpose permits looking after only those old buildings in which the hazard is manifestly greatest, such as old buildings housing clothing and other hazardous industrial establishments in which many people are employed.

Formerly the attitude of owners and tenants of buildings was hostile toward all city inspectors for various reasons and every means was tried to keep these inspectors out of the premises. The standard of municipal electrical inspection, which always has been high, has been raised still more to cause a change in the attitude of the public towards its importance. The inspectors have been continually making suggestions which will minimize existing dangers and also improve the installation in other ways. Consequently it is found that building owners now readily cooperate with the inspectors and even ask their aid in various kinds of electrical work.

Another branch of the work is the investigation and recording of electri-

cal accidents. Last year there were reported in the city 242 such accidents, of which 28 were fatal. The victims of most of the latter were minors and, in fact, many cases school boys who had climbed arc lamp posts and the poles of overhead circuits with disastrous results. There seem to be an increasing number of accidents on pole lines. Mr. Tousley dwelt on the need for inspection of electrical appliances, particularly those sold at low cost to the uninitiated public. He cited many devices sold by department stores which were not only poorly constructed and evidently made merely to sell, but were decidedly hazardous. He discussed a number of accidents from the use of electric vibrators, particularly one which a few months ago caused a great deal of investigation. This emphasized the need for inspection of such appliances before sale, authority for which is now lacking. One company has been found chronically putting out an electric heating device with 25-ampere fuses which were recommended for use on ordinary lighting circuits. At the present time the only way to fight this is to order the outfits out after they have been installed.

Inspection for Central-Station Company.

H. B. Gear, engineer of distribution, Commonwealth Edison Company, spoke of the electrical inspection work carried on by the Chicago central-station company. He called attention first to the great advance in the character of electrical installations during the last 15 or 20 years and narrated a number of incidents in connection with early conduit work. The result of the early poor construction was a multitude of mysterious fires which it was common to charge to crossed wires, in many cases with justice. This condition caused a fear of electric circuits and greatly retarded the early development of electric lighting.

Nowadays, however, electrical construction has been improved to such an extent that not only is the fear of electric lighting entirely gone but it is seldom that one can find new buildings that are not wired and in fact well wired. The requirements for this work have properly become more rigid and this has most decidedly reduced the hazards and at the same time increased the prestige of electric lighting. Of course, the cost of installation has also greatly increased, which has been especially felt in temporary work. However, the central-station company has no quarrel over this situation because it realizes that it is for the best interests of all concerned.

Taking up the inspection work of the Edison Company, Mr. Gear said that it is carried on by about 50 men and primarily concerns itself with the inspection of all of the company's stations, substations and overhead and underground lines, also of all buildings wired by the company's electricians. Another line of work looked after by the inspectors is to make careful inspection of every installation before the service is connected; this is primarily not to check on life or fire hazards, which are well looked after by the inspectors of the city and insurance companies, but for the elimination of hazards to the service. For this reason a set of special rules has been adopted by the company. For instance, it is necessary to limit the number of lamps on one side of a three-wire circuit to 24 lamps in stores and 36 in residences; otherwise serious unbalancing of the three-wire circuit would result with poor regulation thereof. A separate circuit is usually insisted on for the projecting lamps in theaters; in some cases it is possible to balance these lamps with the lamps in the auditorium of the theater. It is also required to have a separate circuit for the wireless outfits of amateurs; also for nickel-in-the-slot electric pianos. The motors of the latter and of other devices cause a severe drop in voltage when started, which becomes very annoying to the lighting circuit. Such motors are therefore frequently made 220 volts and are connected on a separate circuit. In larger installations the motors must be fed from transformers separate from the lighting transformers. In some cases, however, like grain elevators, in which perfect regulation of the lights is not very important, this is not required.

Special rules have to be enforced regarding the placing of meters so as to make them accessible and also free from conditions likely to cause errors. Mr. Gear commended the city rule on meter loops and meter closets in apartment buildings and office buildings.

Discussion.

The general discussion was then opened by F. J. Postel, who presided. He said that the Mutual Fire Prevention Bureau has two standards of construction: one complying merely with the requirements of the National Electrical Code, the other of a still higher standard so as to give the best possible construction, which is in many cases much more expensive than that in accordance with the standard requirements of the Code. Where the latter or more advanced type of construction is used it is possible to get lower insurance rates, which well warrant the additional initial cost. Many grain elevators, flour mills and similar establishments have availed themselves of this practice.

Replying to a question by Mr. Peck, it was stated by Mr. Tousley that the city inspectors cannot make regular inspection of low-voltage signaling systems, telephones, etc., because the inspection force is not large enough; moreover, it has been found that the telephone companies' inspectors look after these installations quite satisfactorily and but little trouble results.

R. S. Huey cited a case in which a vacuum cleaner caused the blowing out of a fuse every time it was started. Mr. Glover said that if on testing such an appliance is found to take over 660 watts, this is so stated on the approval card and it is left to the inspector to see that a circuit of proper size is provided.

S. J. W. Wendt asked whether the size of fuse can be limited by the size of receptacle so as to insure that a proper fuse will be used. To this Mr. Glover replied that the Code does already in a measure so limit fuse receptacles. For instance, the dimensions are specified for fuses rated between 0 and 30 amperes, 30 to 60 amperes, etc. Although these classes are not subdivided, an attempt to make a finer subdivision, particularly of the first class, is being made. Mr. Glover also stated, in reply as to whether temporary approval is issued in cases where material is liable to deteriorate, that this is not done; only one kind of approval is issued and if deterioration is liable to occur keeping track of it is up to the inspectors in the field. Mr. Huey brought up the question of refillable fuses, stating that to him it seemed necessary to use them for some motors. Mr. Glover stated that although these are not formally approved, because of Code restrictions, this matter is now being considered by a special committee.

C. W. Naylor asked why certificates of inspection are issued covering the wiring only and not the fixtures. It was his opinion that much fixture work is done by inexperienced persons and that a certificate of inspection should not be issued until all the fixtures have been installed in an approved manner. Mr. Tousley stated that many buildings are equipped before all of the fixtures have been installed. In many cases the wiring is put in but gas only is used. Evidently it is impossible in such cases to withhold the certificate until the fixtures are completely installed. He also stated that as an evidence of the improvement in the standard of electrical installation it was interesting to note that during 1894 there were 71 fires in Chicago that were ascribed to electrical causes; in 1913 there were 80 such fires, an increase of only 10 per cent in number, whereas the increase in the number of incandescent lamps connected was 1,400 per cent.

Progress In Electrical Department of Panama-Pacific International Exposition.

Working drawings are now being made of the device to be used for suspending the jewels to be used for illumination effects from the various buildings. These jewels, whicl are of hard flint glass, forty-seven millimeters in diameter, hand cut and polished, will be mounted in metal rings one-eighth inch wide with a second holder in back to bring a small mirror against the apex of the jewel, thus giving an estimated increase in brilliancy of 40 per cent. The jewels will be hung by a small handle in such a manner as to permit of free motion in any direction.

A new receptacle in the form of a mission bell is being developed for gala and festive lighting. More than 25,000 of these receptacles will be used in decorative lighting, special lamps being grouped so as to imitate the various forms of fruits and flowers.

Experiments are now being made to determine the extent to which it will be advisable to use electrical substitutes for fire-work displays. Imitations of waterfalls will be used which will show gold and silver showers in the day and be displayed to advantage at night by searchlights.

Complete orders have been placed for all auxiliary equipment required for the operating of the three main direct-current generating stations for the control of direct-current power for exhibitors and decorative lighting. The contract for the electrical work in the Court of Palms and the Court of Flowers has been awarded to Newberry Bendheim, while the order for 2,154 reflectors varying in size from seven to eleven inches was placed with the Wheeler Reflector Company, of Boston, Mass. The plans and specifications for the electrical work for the California building are almost completed, while the orders for the remainder of the electrical apparatus to be used in buildings and on the grounds will soon be placed.

Examination for Electrician.

The United States Civil Service Commission has announced an open competitive examination for electrician to be held on May 6, at the usual places. Vacancies are to be filled in the Departmental Service at Washington, D. C. The usual entrance salary is $4.00 per day.

The examination will cover the writing of reports, practical questions, training and experience. Experience in the care, maintenance, repair and operation of storage batteries and in lead burning is very desirable. Applicants must be at least 20 years of age.

Chattanooga Jovians Hold Meeting.

Chattanooga, Tenn., has a Jovian league, the membership of which has recently been increased from 21 to 68 members.

On March 13, the Chattanooga league had a rejuvenation at Signal Mountain Inn, at which the regular banquet was enjoyed by all. George Herbert, of the Terrell-Hedges Company, took the part of Avrenim and appeared in the costume of a goddess, much to the delectation of the party.

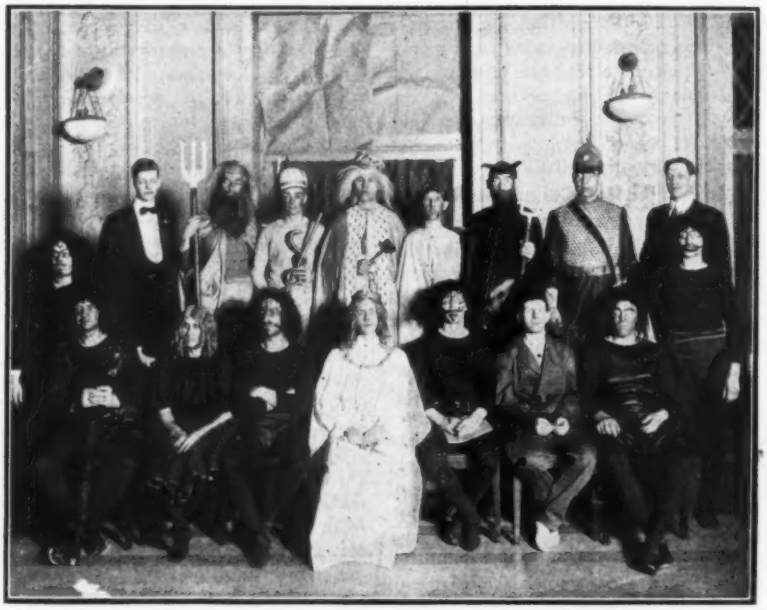
The banquet was held in the café. Paul J. Kruesi, president of the Chattanooga Chamber of Commerce and treasurer and manager of the American Lava Company, presided. Among the speakers were: Byron T. Burt, general manager of the Chattanooga & Tennessee River Power Company; F. H. Cantrell, of the Terrell-Hedges Company; C. S. Steward, of the D. M. Steward Manufacturing Company; J. S. Kirkpatrick, sales manager of the Chattanooga & Tennessee River Power Company and E. D. Reed, general superintendent of the Chattanooga Railway & Light Company. F. W. Hoover, second vice-president of the Chattanooga Railway & Light Company, highest officer of the Clark interests in Chattanooga, was to be among the initiates and speakers, but was compelled to be out of town.

The initiation was presided over by Statesmen J. L. Wilheite, contract manager for the railway and light company, who is an enthusiastic Jovian. The team comprised F. H. Cantrell; P. W. Curtis, of "The Electric Shop"; R. W. Dugger; J. Dugger, city electrician; J. N. Slaughter; C. Rigdon, of the street-railway company; N. C. Blanchard; I. L. Faucette and W. J. Hill.

The Jovians meet once a week informally, lunching together at the Commercial club, Chattanooga's popular dinner club. This is not a secret meeting, the Jovians merely forming a nucleus for a jolly party of boosters. Mr. Burt has tendered the use of a building at the Brady power plant to the league, and there is a tentative plan to have a rejuvenation there in the near future.

Twin City Jovian Rejuvenation.

A Jovian rejuvenation and banquet was held at the St. Paul Hotel Palm Room, St. Paul, Minn., on the evening of Wednesday, March 18. There were about 100 members present at the banquet in addition to the candidates.



Degree Team Which Conducted Rejuvenation at St. Paul on March 18.

Mayor H. P. Keller was toastmaster, and in addition to him the following were seated at the speakers' table: B. O. Horton, J. O. Corbett, O. M. Frykman, Al Frankenberger, J. M. Hannaford, A. W. Zahm, B. B. Downs, C. W. Wilkins, A. J. Anderson, T. P. Glidden, A. J. Cole, H. S. Tuthill and W. E. Keily. The rejuvenation was held during the convention of the Minnesota Electrical Association in Minneapolis and a delegation came from that city, including the Degree Team.

J. A. O. Preus, as representative of Governor Eberhart, made an address on the "Development of the Northwest and its Relation to Minnesota." J. O. Corbett, statesman at large, made an address upon "Electrical Development and Co-operation." During the

dinner entertainment was provided in the form of music and motion pictures.

Immediately after the banquet the rejuvenation was held, the degree team being constituted as follows: Jupiter, Emil Anderson; Neptune, Frank Lang; Mercury, R. C. Rowlands; Apollo, C. L. Hotchkiss; Pluto, Roy Chase; Mars, Tom Findlay; Hercules, Fred G. Dustin; Vulcan, Guy See; Avrenim, George Bloomgren; Imps, R. H. Eddy, Leo Cooper, A. W. Ewert and Charles Hansing.

This team did excellent work.

Philadelphia Jovian League.

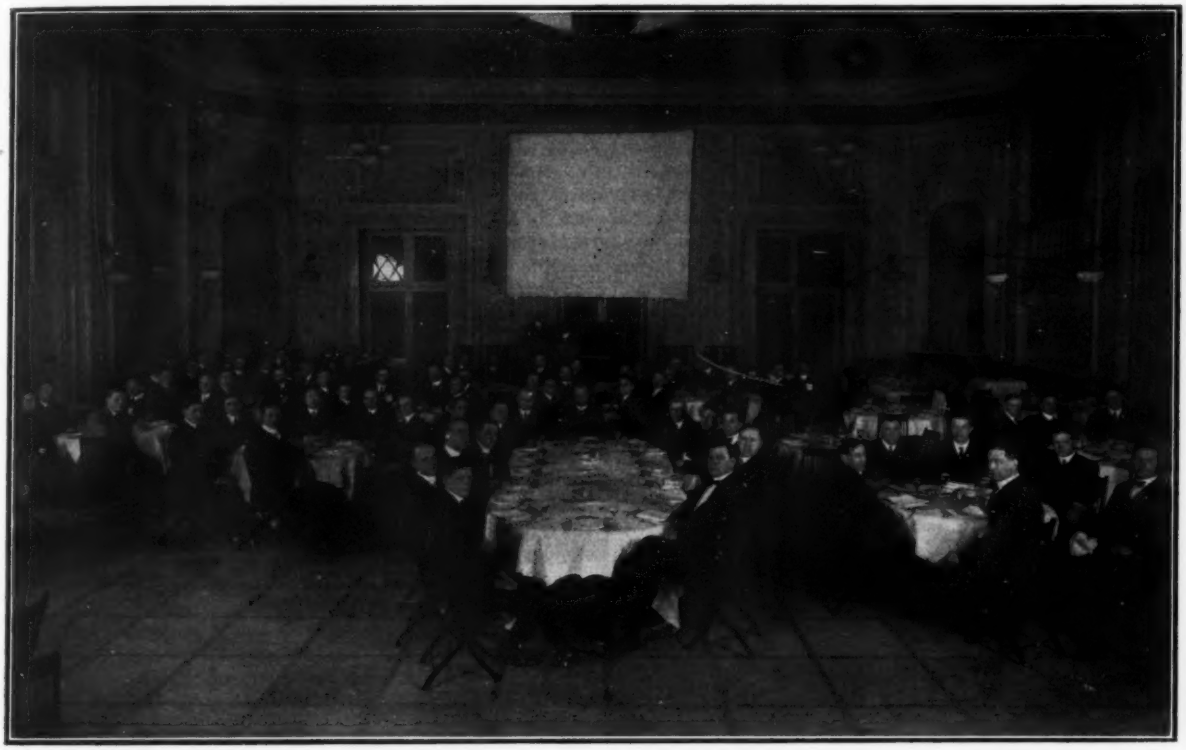
Dr. Thomas E. Eldridge, of the Philadelphia Aeronautical Recreation Society, delivered an address on the limited extent to which radium has proven a cure for cancer, at a recent meeting of the Jovian League, held in the Bingham Hotel. Dr. G. H. Simmerman, also a member of the Aeronautical Society, in conjunction with Dr. Eldridge, offered the use of the Society's new balloon "Greater Philadelphia" for ascensions in connection with the convention in Philadelphia, in June, of the National Electric Light Association. One ascension will be made on June 3. It is designed to utilize the new balloon in advertising Philadelphia.

Chicago Jovian Meeting.

Prof. Philip B. Woodworth, of Lewis Institute, spoke before the Jovian League of Chicago, on March 30, choosing for his subject "Electrical Dimensions." Professor Woodworth interestingly described Sir Oliver Lodge's theory that electricity belongs to the order of the fourth dimension. Prof. George Marsh, of Armour Institute of Techonolgy, presided.

Successful Theater Party Given by Philadelphia Jovians.

On the evening of March 19, the Jovians in Philadelphia and vicinity gave a theater party at the Forrest Theater. The play was "The Doll Girl," a musical comedy. There were about 800 to 850 Jovians and their guests in attendance. The affair was a great success, both socially and financially.



Banquet of St. Paul Jovians at St. Paul Hotel, March 18.

Chelsea Power Plant Extending.

It is proposed to expend $1,100,000 upon the enlargement of the Lot's Road power station which serves the London underground tube and other lines. The output of the plant, which in 1910 was 130 million kilowatt-hours, had grown in 1913 to 156 million kilowatt-hours, and railway extensions now in progress necessitate a bigger capacity. Two 15,000-kilowatt turbo-alternators are to be added, a large coal-reserve storage tank is to be provided, and injection and overflow pipes are to be run to the River Thames for cooling water for condensing.

Turners Falls Plant Under Construction.

Work on the new hydroelectric development of the Turners Falls Company, at Turners Falls, Mass., has been begun. The plans call for the construction of a canal about two miles in length and the erection of a dam and generating station to produce 27,000 horsepower of electrical energy. The work requires the excavation of about 820,000 cubic yards of earth and 120,000 yards of rock ,and the use of 18,000 cubic yards of concrete in the construction of the canal. About the same amount of concrete will be required for the station foundations. Fred T. Lay & Company, Incorporated, Springfield, Mass., is the contractor for the station and the Holbrook, Cabot & Rollins Corporation, Boston, for the canal. Immediately upon the completion of the foundation the station will be erected and generating apparatus installed. The ultimate development, through the canals under contract, will be about 47,000 horsepower.

The Turners Falls Company, through its relations with the Amherst Power Company and other transmission and distributing companies, furnishes electrical energy to a large territory along the Connecticut River in the central and western parts of Massachusetts.

United States District Court Upholds Marconi Interests.

In the litigation of the Marconi Wireless Telegraph Company of America against the National Electric Signaling Company, a decision was rendered by United States District Judge Veeder in the district court at New York, recognizing Marconi, the Italian inventor, as entitled to absolute credit for the creation of commercial wireless telegraphy.

In an opinion filed on March 17, there is given to the Marconi interests, for the present at least, what appears to be a monopoly of the wireless telegraph field.

The patents at issue were No. 11,913, issued to William Marconi on July 13, 1897; No. 609,154, issued on Aug. 16, 1898, to Sir Oliver Lodge and now owned by Marconi, and No. 763,772, issued on June 18, 1904, to William Marconi.

The latest of the three patents is regarded as the most vital of the group in present-day wireless operations. As counterparts of this patent have already been held to be valid by the courts of Great Britain and France, the decision of Judge Veeder was held by lawyers for the Marconi Company to give the company control of the international wireless situation.

While the decision established the validity of the three patents, it holds that the National Electric Signaling Company infringed only the two granted most recently, and not the original Marconi patent, which was issued before improvements made long-distance signaling possible.

Judge Veeder's decision, which goes exhaustively into the history of wireless signaling from the days of Egyptian signal fires down to the Marconi inventions, sweeps away the defendant company's assertions that others preceded Marconi as inventors of a practicable wireless system in this summary of what actually had been done:

"Maxwell, in 1863, had speculated on the possibility of the production of electric waves which would detach themselves from a source of origin; Hertz, in 1887-1888, had proved experimentally that Maxwell's theories were correct; Lodge, in 1889, had repeated Hertz's experiments; Branly, in 1890, had repeated Hertz's experiments, and had also discovered that certain substances, in addition to Hertz's ring resonator, were detectors of electric waves; Crookes, in 1892, had forecast the possibilities of wireless telegraphy by the utilization of Hertzian waves; Lodge, in 1894, had reviewed the experiments of Hertz and Branly and some of his own, touching the form which electric waves took when emanating from their source of origin, and upon substances which would detect these waves; Popoff, in 1895, in similar experiments had noted that he could detect the existence of a distant thunder storm, and expressed the hope that wireless telegraphy could be accomplished by the utilization of Hertzian waves. But no one had described and demonstrated a system of wireless telegraph apparatus adapted for the transmission and reception of definite intelligible signals by such means. This was the state of scientific knowledge and practice when in 1896 Marconi applied for his first patent.

"Accordingly, I find that the evidence established Marconi's claim that he was the first to discover and use any practical means for effective telegraphic transmission and intelligible reception of signals produced by artificially formed Hertz oscillations."

More than fifty pages of Judge Veeder's decree is given up to a discussion of the third Marconi patent, which has been held to be valid in Europe. Of the manner in which Marconi achieved his final wireless triumph with instruments made under this patent he said:

"With this apparatus Marconi communicated across the Atlantic in 1901 and claims in issue constitute the essential features of apparatus which has since made possible communication over a distance of 6,000 miles. It has been used in more than 1,000 installations by Marconi, and is admittedly an essential feature of the wireless art as at present known and practiced."

The Marconi Company was represented in the litigation by the law firm of Sheffield, Bentley & Betts, and the National Electric Signaling Company by the law firm of Clay, Ogden, Winter & Church.

Illumination Scheme for Palace of Horticulture.

W. D'A. Ryan, chief engineer of illumination of the Panama-Pacific International Exposition, has evolved a unique plan for the illumination of the various palaces at the Exposition.

The Palace of Horticulture will be constructed almost entirely of glass and will be surmounted by a dome 150 feet high and 152 feet in diameter, which will be fully covered with glass. If illuminated from the interior by ordinary methods this dome would have presented a "dead" appearance at night, instead of being one of the feature spots of the Exposition, as it will be, in fact. Sixteen 30-inch searchlight projectors will be placed in a circle about a column in the center of the building. At the top of the column are arranged a color screen with six segments, an opaque vane which will cover two segments at the same time, a lens and a diffusing plate.

The segments of the color screen are of red, green and yellow. The screen will revolve at the rate of 500 revolutions a minute and the vane at the rate of 499 revolutions a minute. This enables the screen to make one full revolution a minute more than the opaque vane.

The rays of the searchlights are focussed on the screen and diffused on the dome, the revolution of the screen and vane causing the various colors to illuminate the glass in succession.

A combination of three lenses will be used, so arranged that only one will be in position over the screens at one time. One of these will be composed of a number of tiny lenses which will have the effect of producing spots of light upon the dome. Another will be plain. The third will produce the most spectacular effect and will present the appearance of millions of tiny tadpoles squirming about the interior of the dome.

Street Lighting at Augusta, Me.

The visitor to Augusta, Maine, is struck with the admirable electric lighting of Water Street, the main thoroughfare of the city. If he arrives at night, at the Maine Central Railroad station, as he steps out onto the street he is bound to remark the exceptionally brilliant lamps, arranged in groups of four on ornamental iron poles. There are 75 such groups on Water Street, and they are spaced only 100 feet apart, on both sides of the street. The lamps are 100-watt Mazdas and are inclosed in opal globes. The wires, of single phase, are carried on brackets at the top of the poles. The lamps are operated on 110 volts, the current being furnished by the Central Maine Power Company, which has eleven hydroelectric stations on the Kennebec River and its tributaries, besides an auxiliary steam plant at tide water below Augusta. The company's high-tension system is 200 miles in extent.

The city of Waterville, about 20 miles north of Augusta, boasts 45 groups of lamps of similar type and arrangement, on Main and Silver Streets, in the business section.

Spring Meeting of Electrochemists.

The twenty-fifth general meeting of the American Electrochemical Society will be held in New York City, April 16 to 18. Technical sessions will be held on Thursday morning and afternoon at the Chemists' Building, and on Saturday morning and afternoon at Columbia University. On Friday there will be an all-day steamboat excursion. On Thursday evening there will be a smoker. On Saturday evening there will be a dinner-dance.

FRACTIONAL-HORSEPOWER MOTORS.

By Gordon Fox.

This is an era of power, man using his energy more efficiently to direct rather than to perform. It is cheaper to pay for power than to perform work by human effort. Small motors are therefore being adopted for all purposes in which human exertion can be replaced automatically. The small motor performs service out of all proportion to power cost, that cost being compared to the cost of human effort.

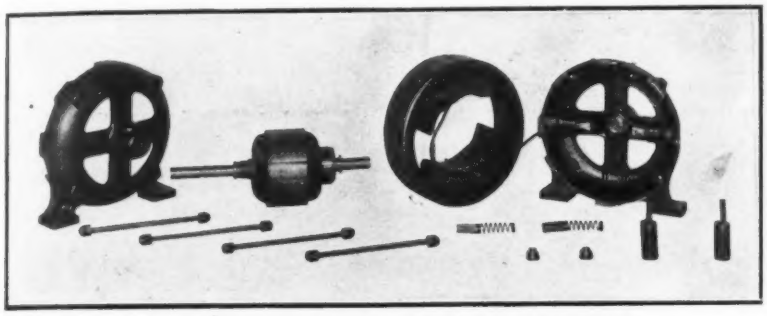


Fig. 1.—Fort Wayne Direct-Current Motor Disassembled.

At first the fractional-horsepower motor was merely a smaller brother to the regular power motor, small motors being considered as one-half horsepower and below. Growth was slow because drives were not thoroughly worked out to meet requirements and were not entirely satisfactory. Experience has taught that there is as much or more care required in designing a motor drive for a small power machine as for the larger machines. The motor manufacturers have broadened their lines, experimented to secure different characteristics and to determine the limiting features of each of their designs. The manufacturer with a new device is no longer advised to "put on a one-eighth or one-sixth horsepower motor." An expert is sent out to see the machine in action in its field, noting all conditions affecting the drive. The device is taken to the motor factory and thoroughly tested. From the data thus obtained a motor is selected or designed to fit the machine. This is found to be the only manner in which continued satisfaction can be assured.

The successful small-motor application is a matter largely dependent upon careful attention to detail. First, in selection, every feature affecting the drive must be considered; second, in manufacture, constant minute scrutiny is required to insure uniformity of product. In designing the drive, limits of variation should be established for

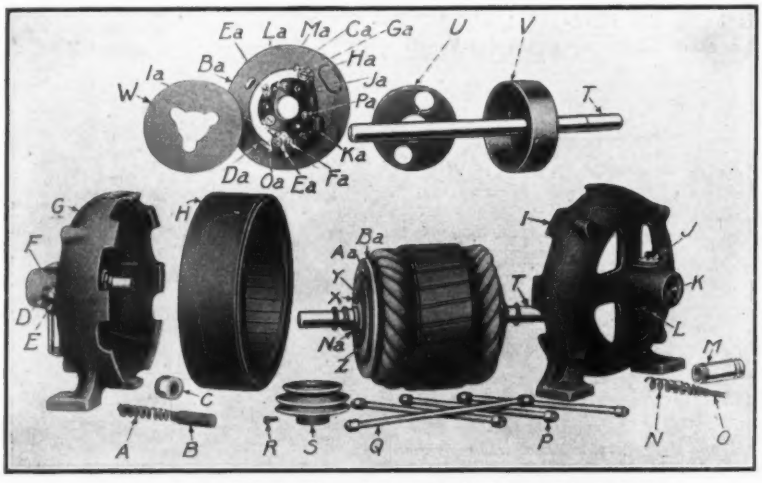


Fig. 2.—Fort Wayne Alternating-Current Motor Disassembled.

use in subsequent inspection and test.

In the large-motor field a few standard frames and ratings are commonly carried and these are adapted to their driven machines usually by building the machine to fit the motor or by addition of special parts. This is mainly because few motors are used for identical applications.

Fractional-motor applications are usually quantity propositions. Therefore the motor and driven machine are best considered as a whole and a complete design worked out requiring a minimum of machine work, maximum ease of assembling and greatest probability of uniform results. From a manufacturing viewpoint it is a matter of designing lines of standardized working parts which can be easily adapted mechanically to standard frames or can be worked in effectively as part of general designs. The aim is to provide as many ratings and as large a variety of characteristics as possible from standardized parts.

The great variety of applications imposes a corresponding variety of limiting features upon the motor. In one case weight may be all important, as for a portable device; again, freedom from noise is necessary, as in a piano motor; in some cases heavy breakdown or pull-out torque is a limiting

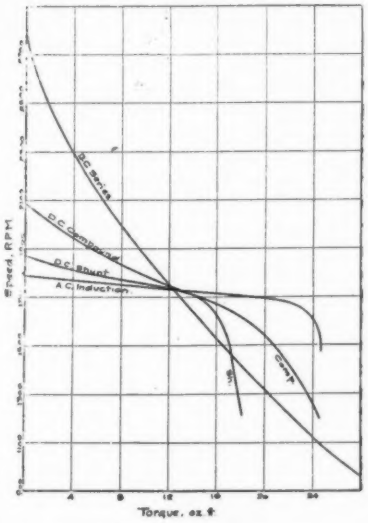


Fig. 3.—Speed-Torque Curves.

feature, as is the case with a washing machine drive where a wringer is used. Constant speed may be very important or ability to start quickly and repeatedly. Mechanical dimensions often play an important part. A minimum diameter is often advantageous because of limited space, or the over-all length may be restricted for the same cause.

As practically all devices driven by small motors are for general sale and distribution, it is necessary to build them for all voltages and classes of current commonly encountered. In order to reduce costs of patterns, drawings and machinery; in order to stock machines and furnish the proper motor upon receipt of the order, or to change motors when the user moves or otherwise changes his power, it is very advantageous to all concerned if motors for different currents can be supplied having the same mechanical dimensions. The more progressive

manufacturers are now able to meet this requirement.

As before stated, each application has its particular specifications which must be closely followed and maintained. There may be in the factory, parts for many different orders being carried through simultaneously. A tremendous amount of detail must be accurately executed to insure success. It is evident that standardization should be carried as far as possible to avoid multiplicity of specifications and to simplify inspection, as well as for reasons of economy. The fundamental purpose should therefore be, standardization of basic parts, specialization in method of assembling.

The essentials of a small motor are, the stator, the rotor, the shaft, the commutator, collector or switch, the bearings and their supports. The stator and rotor are made up of stacked punchings. Here is a point in which standard parts may be variously assembled to gain flexibility of ratings and characteristics. The same punchings may be stacked "long" or "short." A difference in the stacking length will affect the shaft and may affect the frame. If the end flanges holding the bearings in the standard motor can be arranged to fasten to the ends of the stackings then the same flanges may be used for different stacking lengths. Windings must, of course, be special. Commutator or collector parts can be made standard. It is thus possible to provide a variety of characteristics and ratings from a set of standard parts by simply furnishing three or four shaft lengths, and varying the winding designs.

The bearing flanges for alternating and direct-current motors must frequently be different for the end containing the brushes or current-carrying parts. If mechanical dimensions are similar and the flanges for the two ends of the motor are made independent, it is possible to use the same standard or special pulley-end flange for both alternating and direct-current motors. Reference to Fig. 1 may make this point more evident. This is an exploded view of a small direct-current motor. This is assembled by placing the rotor in the field, sliding the flanges over the shaft ends and holding the whole together with the through rods.

Here it will be seen that different stacking lengths affect only the windings, shaft and through rods, the same flanges being applicable. It can also be seen that the pulley-end flange to the left in the figure, can be equally well used for an alternating-current motor similarly constructed. An exploded view of such an alernating-current motor is shown in Fig. 2, the pulley-end flange in this case being to the right.

Direct-current fractional-horsepower motors are commonly wound for shunt, series and compound connections. Alternating-current motors are mostly single phase, of the induction type in the larger sizes, some sort of split-phasing arrangement being used for starting. Ordinarily a starting winding is provided which is cut out by a centrifugal switch as the motor attains its speed. The comparative characteristics of a standard line of motors are shown in Fig. 3. It will be noted that all the curves have a common point, this being the rated full load. With changes of load they all act differently.

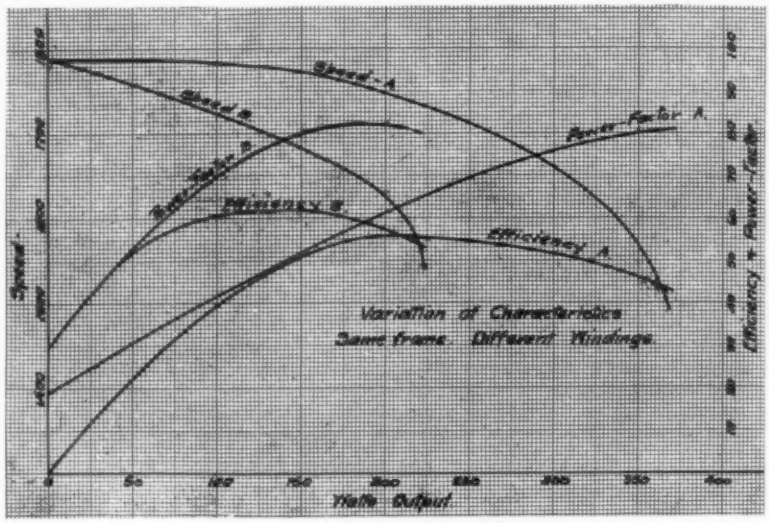


Fig. 4.—Change of Characteristics with Winding.

Of course, the exact characteristics can be changed according to the design of the windings.

The winding design is largely a matter of compromise. Starting and pull-out torque, constancy of speed and efficiency, and power-factor, with the consequent heating effects, are the points commonly affected. Fig. 4 shows the characteristics obtained from two different windings upon the same frame of a small single-phase induction motor. It will be noted that heavy pull-out torque and constancy of speed over a wide range of load are here obtained at the sacrifice of efficiency and power-factor. Motor A would, therefore, run considerably warmer than motor B under the same load, but would be able to carry much heavier overloads for short periods. Motor A would be used for meat choppers or washing machines with wringers, whereas motor B would

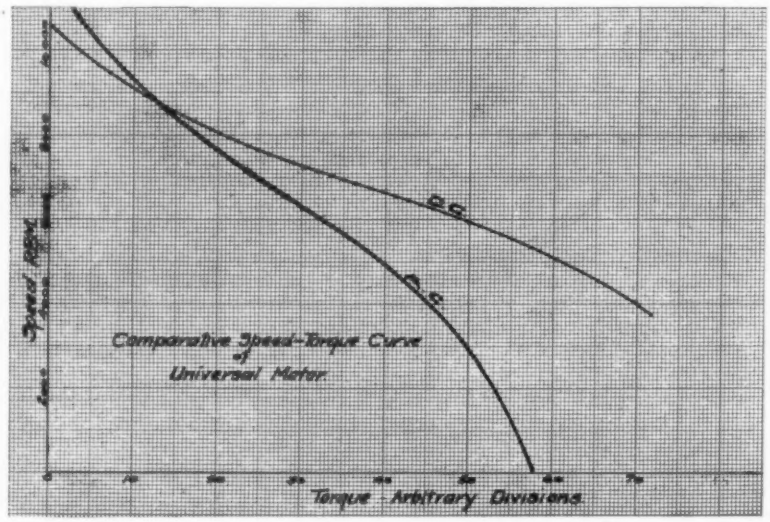


Fig. 5.—Curves for Universal Motor.

be used for piano work or for washing machines without wringers. This case is illustrative of the whole matter of small-motor design where compromises are made which best meet the demands of each particular drive. It is evident that it is not sufficient to

specify merely the horsepower rating and speed desired, as motors acting widely different can be furnished to meet these specifications.

There are many light power devices requiring motors of very low output. Portable vacuum cleaners are a notable instance of this type of device. It is impossible to build the single-phase induction motor in these small sizes. Alternating-current motors cannot be connected in shunt because of power-factor differences of armature and field. These very small motors are commonly series-wound. The alternating and direct-current motors are built from the same parts but the windings differ in most cases. Very careful study of the load imposed by the driven device is required, since with a series motor, a slight change in load causes a material difference in speed. It is difficult to build motors of this type to give consistent results within close limits, because a minute variation in mechanical dimensions such as air gap or commutator setting causes appreciable difference in operation. A certain leeway must be allowed in the application or a percentage of motors will be returned, due to overload, heating or sparking. In many of these devices the cost of assembling and testing is a relatively large item. If the percentage of rejections be high and many machines must be disassembled, repaired or changed and retested then the unit cost is materially affected. Hence careful inspection of all parts before assembling and a little leeway in load range are desirable features.

Commercial considerations have made it very desirable that these small motors be universal, operating upon direct or alternating current interchangeably. Domestic users are constantly moving to new premises where different current is obtainable. Portable tools are often to be used at places having different kinds of power. Dealers must stock for all currents and the manufacturer also is hampered by a variety of windings. No strictly universal motors have as yet been developed. Some windings have been produced which will operate upon 60 and 25 cycles and direct current, but the characteristic curves differ. At the rated load the curves have a common point. Fig. 5 shows the variation in operation of a universal motor upon 60-cycle alternating current and direct current. These universal windings have proven satisfactory only for high rotative speeds. Low-speed motors require a stronger field, more armature turns and consequently more inductance. The low-speed motor placed on alternating current drops in speed more quickly, has little overload capacity, and sparks. Universal motors, being universal at but one point in the load curve, demand that the power required by the driven machine be accurately determined so that the universal point may occur at the corresponding output.

It is a difficult matter to provide a small series motor to operate at a moderately constant speed with load changes. Slow-speed motors are also hard to build since the large number of armature turns is productive of sparking. A special connection used to meet these requirements may be of interest. This connection is shown in Fig. 6. It will be seen that the series field is connected in series with a resistance across the line. This causes the field to be quite uniform, due to the constant current that will flow across this circuit. The armature is shunted across a part of this resistance. The armature therefore has but a low impressed voltage, with but few armature turns required. The power-factor of armature and field will be nearly the same with this arrangement and the torque is therefore good. Due to the uniform field a constant speed is obtained; due to the low armature voltage a low speed may be had with no sparking. At starting, the rush of armature current strengthens the field, giving a compounding effect with good torque and quick acceleration.

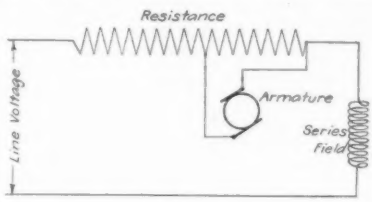


Fig. 6.

A summary of the points to be considered in planning a small motor drive may be useful. Not all of the points will apply in every case, but it is well to check against them to be sure nothing is neglected having a bearing.

The motor manufacturer should be given a description of the machine to be driven, stating its purpose, field and the number of sizes to be built. He should know the state of development to know whether special features for the motor or machine would be better or cheaper. Also the probable consumption affects this decision. He should know where the device will be installed and surrounding conditions such as moisture, dirt or gas. He should know the amount of space the motor may occupy. He should know the class of users, to estimate the care that will be given and to plan accordingly.

Next, it should be stated clearly just what the motor is to do. How will it be mounted? What means of drive will be used? If belted, the pulley dimensions, belt centers and means of adjustment are important. If coupled or geared, bearing service and thrust provisions should be considered.

What should the full-load speed be? How much leeway is permissable? Is particularly constant speed desired?

Direction of rotation, open or inclosed, rating and continuous or intermittent service are questions to be answered. If the work is not continuous an estimate should be made of the periods of work and of rest, stating whether the motor is stopped or runs light.

The load cycle should be determined as accurately as possible. The amount of load, adjustments affecting the load and their results, and features limiting the range of load all have an important bearing. Load and service data determine the heating.

The starting and working torques should be determined if possible. Many machines perform a cycle of operations requiring different torques at different periods. Some may start only at one point in the cycle, others may start at any point. If the motor may be called upon to start at the point of maximum torque, that is a limiting feature. Torque may be determined by means of a small spring balance. Measure the ounce-feet pull at the driven shaft at various points in the cycle. This may be accomplished by simply attachinch the balance to some point at a given radius and pulling until the driven shaft starts to move, noting the pull at starting and after the shaft is in motion. Multiply the speed of this driven shaft by the ounce-feet of torque and divide by the motor speed. The result is the ounce-feet of torque required of the motor. These data may also be used to check the power consumption and load. The average torque multiplied by motor speed in revolutions per minute divided by 528, gives the horsepower load. Measured torques are necessarily taken with the machine just moving slowly and may not correspond exactly to running torques. In some cases, such as fans or blowers, the starting and running torques may differ widely.

Other considerations affecting the motor selection are rapidity of acceleration required and frequency of starting. Are there any special considerations, such as noise, magnetic effect of the motor, absence of end play at the shaft, etc.?

The whole matter of small motor application, it will be seen, is one requiring careful study and attention to detail to insure satisfaction. It is hoped that this outline may be suggestive toward obtaining more successful small-motor drives for numerous purposes.

New Electrical and Mechanical Appliances

New Adaptibox Service Caps.

The Adapti Manufacturing Company, Cleveland, O., has added to its extensive array of the now well known Adaptiboxes new sizes of service caps which complete the line of service entrances for conduits ranging from one-half inch to four inches. The new sizes are suitable for one-half-inch and three-quarter-inch conduits and are believed to be the smallest fittings of this class now on the market.

These new service caps, like other Adaptibox fittings, possess valuable interchange features. The cap is interchangeable for two different sizes of outlets; thus the one-half-inch size can be adapted to three-quarter-inch conduit by simply changing the outlet. Moreover, by changing the straight or standard type of lug for an elbow lug the fitting can be readily changed from a straight to an elbow cap, as shown herewith.

Since both the outlet and cover are removable it is very easy to pull the wires. The cover is made of special insulating material of exceptionally high dielectric and mechanical strength that is said to be superior to porcelain. No bushings are required. These fittings have been approved by the Underwriters' Laboratories.

Service Caps.

Paine Expansion Shells Withstand Severe Tests.

The expansion shells and toggle bolts manufactured by the Paine Company, Chicago, were described in our issue of January 3, 1914. Since that time the company has had a number of its three-quarter-inch expansion shells tested in the testing laboratory of Lewis Institute with exceptionally interesting results.

Two holes each one and nine-sixteenths inch in diameter were drilled about four inches apart near the center of one face of a block of stone about two feet square by one foot thick; this stone was described as oölitic limestone. One hole was 4.75 inches deep and the other 6 inches deep. A three-quarter-inch Paine expansion shell with wrought-iron rod was put into each hole and expanded as far in the hole as possible. The rods had carriage-bolt heads and were threaded for a standard three-quarter-inch rod to within five inches of the head. A clear space of about six inches was left between the face of the stone and the jaws gripping the ends of the rods.

On applying a powerful pull on the jaws by means of a testing machine, it was found that the shells held in the holes indefinitely and that the rods parted, in the shallower hole at a net pull of 16,740 pounds and in the six-inch hole at a net pull of 15,640 pounds. The tensile strength of three-fourths-inch wrought-iron rods is usually given as 15,200 pounds; thus the rods were even stronger than standard. These tests show the extraordinary holding power and dependability of the Paine expansion shells, which apparently does not depend on the depth of the hole. The tests were made by Prof. A. W. Mosely.

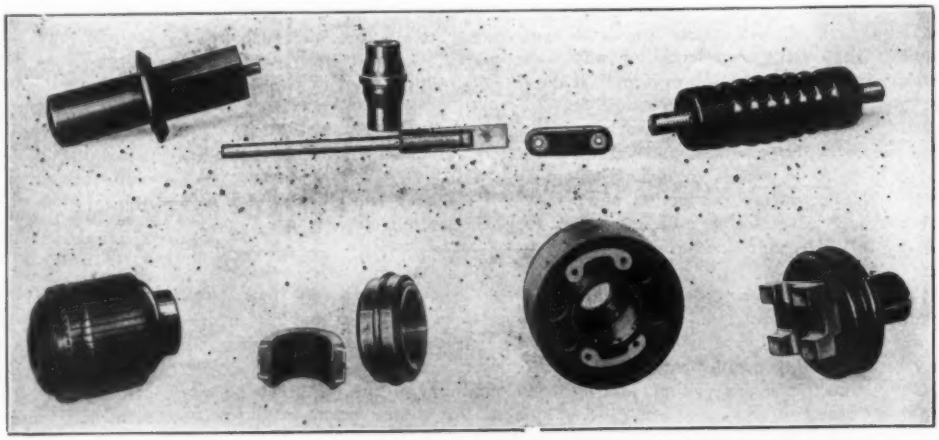
Some Interesting Insulation Parts.

In the illustration below are shown a number of the different insulation parts made by the Stevenson Company, Wilkinsburg Station, Pittsburgh, Pa., from its various Bakelite molding mixtures. These parts will be particularly interesting in that they are practically all for some piece of electrical apparatus and, furthermore, show very plainly the accuracy attained by workmen of this company in molding in metal parts or inserts.

The sectional view of the pin in the top row is an excellent example of accurate molding and perfect insulation. These features are further emphasized by the sectional view of the collector ring in the bottom row of the group.

Bakelite parts mark the first real advance in the art of plastic insulation in half a century, yet the success of each piece depends largely upon skill in compounding the various mixtures and accuracy in molding. Higher dielectric and mechanical tests are claimed for the product of the Stevenson Company than for any other similar material.

Bakelite insulation has been in use but a few years and it may not be generally known to what extent these parts are used today. Besides following closely in the path of the electric motor and blanketing the electrical field, it is now molded into various



Electrical Apparatus Parts Made of or with Molded Insulation.

parts such as collars, base blocks, spools, pinions, valve gates, meter disks, boxes, washers, thimbles, fingers, etc., etc., to take the place of hard rubber or raw hide and resinous material parts in many fields.

It can be readily drilled, tapped, machined or buffed to a very high finish. The regular molded finish, however, is suitable for nearly every purpose. Stevenson molded insulation is claimed to be high-heat resisting, non-hygroscopic, impervious to oils, moisture and most chemicals. It will not warp, soften, decay or otherwise deteriorate with age.

It can be furnished in round or square solid bars, round or square tubes, and plates of reasonable size for stock from which special parts may be machined as needed. It also comes in two or three different colors, to match different finishes.

Fig. 1.—Portable Electric Buffer.

Stow Portable Electric Tools.

The great convenience and adaptability of electric drive for small portable tools is being so well recognized that a rapidly increasing demand has been developed for such appliances in machine shops, garages and other places where speed and labor saving count. Among manufacturers making such tools is the Stow Manufacturing Company, Binghamton, N. Y. These tools are of considerable variety, some of which are illustrated herewith.

Fig. 1 shows a portable electric buffer equipped with the well-known Stow flexible shaft, which makes it a most useful appliance for polishing brass signs, the bright parts of automobiles and metal work of all kinds in office buildings, hotels, engine rooms, etc. These buffers are made in four sizes and are supplied with either direct-current or alternating-current motors. The energy consumption is small, so that the appliance can be connected to a lamp socket. A buffing wheel or emery wheel can be used on each outfit. One of these is mounted on a pedestal to permit greater freedom for the hands when the motor cannot be placed on a table or box.

Fig. 2.—Electric Breast Drill.

In Fig. 2 is shown a new electric breast drill capable of drilling holes up to one-half inch diameter in iron or steel or up to one inch in hardwood. All parts of the drill are equally balanced, making the tool easy to handle. Power is applied at opposite points on each reduction gear. These drills are carefully constructed so as to reduce upkeep to a minimum. They are provided with 110 or 220-volt motors. The direct-current tools are 16.5 inches in total height, including chuck, and weigh 20 pounds; the alternating-current tools are slightly heavier. In each case a Pratt or Jacobs cluck is furnished as desired.

A new form of radial flexible boring and utility machine is shown in Fig. 3. Its design is based on the similar Stow machine that is said to be in use by 70 per cent of the leading wagon and carriage manufacturers in this country, but the machine shown herewith is adapted for general shop work. It has the advantage of being easily transferred to any part of a shop accessible to a lamp socket. The machine can be used for boring, drilling, emery grinding and buffing. The motor acts as a counterbalance to the extension arm to which the flexible shaft is attached. This construction also permits of higher speed with less wear on the flexible shaft. The upright stand is telescopically adjustable and the arm can be extended when supplied with a longer belt. It can be swung in a complete circle, thus having a wide range of work.

Fig. 3.—Boring and Utility Machine.

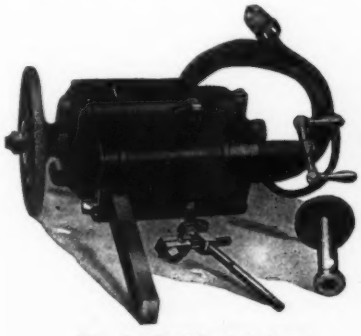


Fig. 4.—Tool-Post Grinder.

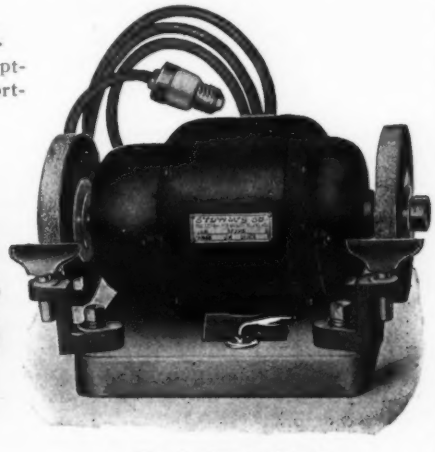


Fig. 5.—Bench Grinder.

Fig. 4 shows a convenient tool-post grinder made either with hand feed, as shown, or plain. It takes a three-eighth-inch by six-inch emery wheel and is suitable for either surface or internal grinding. It is particularly serviceable for grinding dies, cutters, centers, etc.

An electric bench grinder with two emery wheels is shown in Fig. 5. This is made, like the other tools, for direct current and also for alternating current and in five sizes, ranging from 6-inch to 12-inch wheels. This is a compact and highly efficient tool.

New 1,500-Volt Direct-Current Freight Locomotives for the Piedmont & Northern Lines.

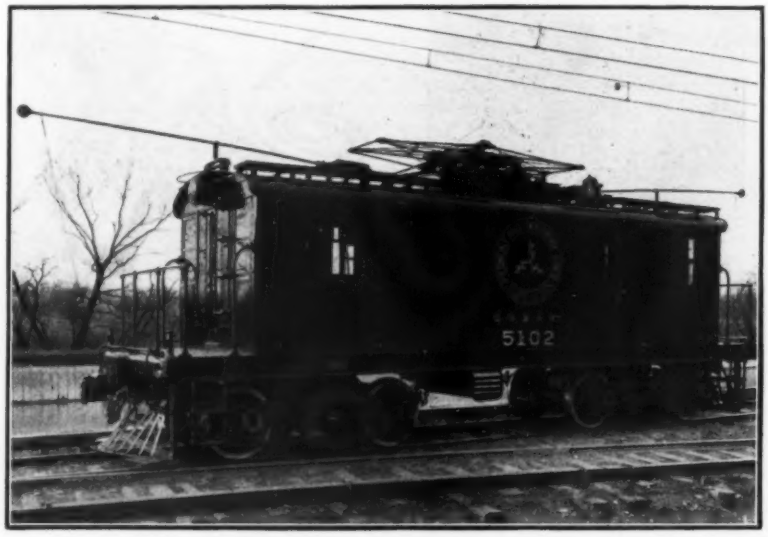
The Piedmont & Northern Lines, Charlotte, N. C., are placing in commission six new 1,500-volt direct-current locomotives on the Greenville, Spartanburg & Anderson division of their system. These locomotives weigh 63.5 tons with all the weight on drivers, have the box type of cab extending nearly the entire length of the underframe and are designed for heavy freight service. At the normal rating of the four motors, with which each locomotive is equipped, operated on 1,500 volts two in series, they will develop a tractive effort of 17,500 pounds and a speed of 21 miles per hour. The locomotives will handle trains of 800 to 1,000 tons gross weight.

The Piedmont & Northern Lines comprise two main divisions, which, when entirely completed, will embrace 280 miles of track for limited and local passenger, express and heavy freight service. One division, operated by the Piedmont Traction Company, extends from Charlotte, N. C., to King's Mountain, N. C.; 23 miles of this road are in operation at the present time between Charlotte and Gastonia, but the remaining 12 miles from Gastonia to King's Mountain are yet to be constructed. The other division, operated by the Greenville, Spartanburg & Anderson Traction Company, extends from Greenwood through Greenville to Spartanburg, S. C., and joins the northern division at King's Mountain; 95 miles of this road are now in operation from Greenwood to Spartanburg, including a 10-mile spur running from Belton to Anderson. The section between Spartanburg and King's Mountain is also yet to be closed, and with the northern gap through to Gastonia leaves about 50 miles of the system yet to be built.

All these lines operate on 1,500 volts direct current. Energy is purchased from the Southern Power Company and is delivered from the transmission lines to two substations for the Piedmont Traction Company, one in Charlotte and the other in Gastonia. On the southern division of the road there are four substations, one three miles south of Spartanburg, one at Greenville, one at Belton and one at Downs, which is three miles out of Greenwood. The roads have a very heavy freight traffic and transport great quantities of cotton from shipping points to the various mills along the route, and in turn fabric from the mills to connecting stations for distribution to distant markets.

The new locomotives were designed and built by the General Electric Company. The cab is of the all-steel box type; outside platforms of suitable width are left at each end for the switchman to handle the trolley poles and are protected by side and end hand or guard rails. In the interior the cab is open throughout as far as is consistent with the apparatus located therein. While the operating mechanism is grouped in the central section, it is not located in a compartment separate from the operating cabs. Convenient passageways run along each side and connect with the operating positions in each end.

The underframe or backbone of the locomotive consists of four 10-inch steel channels extending the entire length of the platform. These channels are tied together by heavy end-frame box-girder castings and bolster plates. The bolsters are built up of



New Direct-Current 1,500-Volt Freight Locomotive.

18 by 1-inch plates, the top bolsters being carried clear across the platform and riveted to all four longitudinal sills. The two center channels are enclosed throughout with steel plates riveted to the under sills and carry the center-pin castings, which are bolted to them. The space between the center sills serves as a reservoir for distributing air from the blowers to the motors. Openings in the floor of this reservoir admit air from it through suitable intake pipes into the back end of each motor.

The drawhead castings are bolted to the center sills, which in turn are riveted to the end frames. The draft gearing consists of MCB couplers. The whole platform is floored and braced by heavy steel plates running the width of the locomotive and riveted to the longitudinal sills. In the cab this is covered with the usual wood flooring. Necessary ballast required to bring the locomotive up to its rated weight consists of steel bars running the whole length of the platform, notched over the bolster plates and bolted to the longitudinal sills. Pilots with switchman's steps are bolted to the end frames and braced to the side sills.

The two four-wheel trucks are of standard swivel type, designed for heavy freight work. The side frames are built of heavy rolled bars for top and bottom members with cast-steel pedestals. The bolster, or center transom, is bolted rigidly to the side frames, and the entire weight of the truck framing is supported on heavy semi-elliptic springs hung by links to the double side equalizer bars, which in turn rest on the journal boxes. The wheels are solid rolled steel, 36-inch diameter. The axles are forged open-hearth steel, six inches in diameter between the wheels. The air brakes are the combined straight and automatic type. The brake shoes are inside hung, and the brake rigging is proportioned for a brake-shoe pressure of 85 per cent of the weight on the drivers with 50 pounds pressure in the brake cylinders. Hand brakes are provided to hold the engine in the yard in case of loss of air pressure in the brake cylinders.

Taking up the electric equipment, the locomotive is driven by four GE-212 F, 600-1,200-volt, box-frame, commutating-pole motors, insulated for operation on 1,500 volts. Each motor is geared to an axle; all the axles are therefore driving axles. A forged pinion is mounted on each armature shaft and meshes into a corresponding solid steel gear mounted on the axle. The gear ratio is 65 to 18, making 3.61 gear reduction. The continuous capacity of

each motor is 200 amperes under forced ventilation, and 269 amperes at the one-hour rating. For the complete equipment of four motors on a locomotive this is equivalent to a continuously sustained tractive effort of 11,200 pounds at the rail head.

The motor is inclosed and is designed especially for locomotive service. Through the method of forced ventilation employed, air is circulated over the armature and field coils, over and through the commutator, through longitudinal holes in the armature core, and thence exhausted through openings in the bearing head. A large volume of cool air is thus distributed effectively throughout the motor, which keeps all parts at a uniform temperature and eliminates the possibility of "hot spots."

The control equipment is Sprague-General Electric type M multiple-unit control, arranged to operate the four motors in series and series-parallel connections. The pairs of motors with their respective resistances are all connected in series on the first point of the controller. The resistance is varied through six points and finally short-circuited on the seventh or running point. The pairs of motors are then operated similarly in series-parallel and all resistance is cut out on the twelfth point, which is the full-speed running point. This provides control connections with seven steps in series and five steps in series-parallel. The transition between series and series-parallel is effected without opening the motor circuit, and there is no appreciable reduction in tractive effort during the change. This smooth transition between control points permits operating the motors close to the slipping point of the wheels throughout the entire range of acceleration without sudden fluctuations of tractive effort. Two switches are provided for cutting out either pair of motors, so that the locomotive can then be operated with one pair of motors in the usual manner.

One of the new and distinctive features for a locomotive of this type is the convenient manner in which the apparatus is arranged in the central section of the cab so as to afford ready and complete access to all parts for inspection, cleaning, adjustment or repair. The main motor rheostat boxes are mounted in banks in an inclosed sheet-steel compartment in the cab center. This compartment extends from the floor to the roof and is accessible through doors opening into the passageways on each side. The floor in the compartment is open and it is surmounted by an open monitor deck. Thus there is a continuous draught of air rushing up through the compartment while the locomotive is running, which affords exceptionally good ventilation. The rheostats are formed of the usual cast-iron grids assembled in frames and insulated with mica. This arrangement allows ample rheostat capacity for the locomotive, as there are 18 resistance units included in the group.

At each end of the rheostat compartment and suspended from the roof of the cab in laterally inclosed steel frames, accessible through lift doors at the sides, are grouped the contactors and reverser. Beneath these are installed on the floor the dynamotor, blower and one of the air reservoirs in one end, and the two air compressors and the other air reservoir in the other end. All mechanism and circuits carrying 1,500 volts are thoroughly insulated and protected from accidental contact.

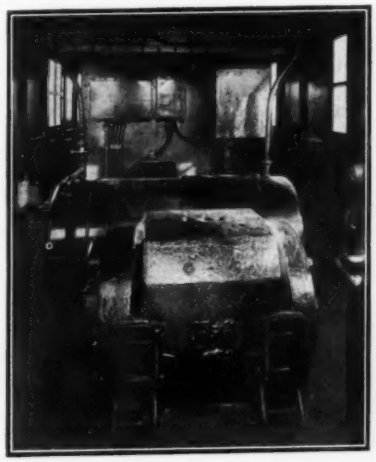
The blower set for ventilating the motors has a liberal capacity and is driven by a series-wound motor of the railway type. Air is taken from the exterior through a suction box with side louvres underneath the platform at the center. Current at 600 volts for the operation of the blower, and also the air compressors, the contactors and the lights, is furnished from a two-fifth's tap taken from the dynamotor. The contactors are of the same general design as that employed in the standard 600-volt type M control. The principal modifications are embodied in the greater insulation distances and more effective methods of insulating where the contacts and magnetic blowouts make and break on the 1,500-volt circuit.

The air compressors are two-stage motor-driven machines and have a total piston displacement of 70 cubic feet per minute when pumping against a tank pressure of 90 pounds per square inch. Air is taken in from the interior of the cab through strainer screens, which prevent the entrance of injurious particles of dust, and is delivered into the two air reservoirs, each 28 by 60 inches, connected in series, thereby affording an opportunity for radiation of heat and condensation of moisture before entering the air-brake cylinders.

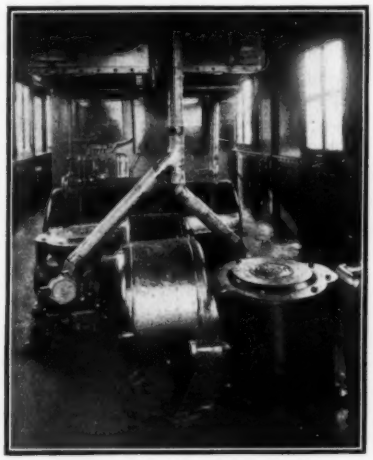
At the operating positions, in each end of the cab, are located the engineman's seat, controller, air-brake valves, bell and whistle ropes, ammeter, air gauges, sander valves and other parts of the control apparatus that should be within his immediate reach. A tool box with complete equipment of tools is also provided.

Current is collected by an overhead pantograph trolley, which is pneumatically controlled and can be put into service from either operating station by a manually operated valve. The trolley is arranged for a minimum operating height of 14 feet 6 inches and a maximum height of 22 feet. On some of the local lines which form

Operating Equipment at Ends of Cab.



View of Equipment Near Middle of Cab.



Another View Inside of Cab.

the system, the overhead construction is not adapted for the pantograph trolley, and in order to operate over such lines, the locomotives are equipped with pole-type trolleys and trolley wheels. Some of these local lines are operated on 600 and in some cases as low as 500 volts direct current. A change-over switch is installed for cutting out the dynamotor while the locomotive is operating on low-voltage circuits, so that in such cases the current for the auxiliary control and supply circuits is obtained direct from the trolley circuit. This change-over switch is protected by an automatic relay, which makes it impossible to connect 1,500-volt trolley current to the auxiliary circuits of the locomotive.

The main switch is provided with a powerful blowout so that heavy currents can be handled without damage. There is also furnished a complete equipment of auxiliary switches, one each for controlling the lighting, compressor and blower circuits, two each for the headlight and control circuits, two motor cutout switches already mentioned, and also two manually operated main auxiliary switches for cutting around the 1,500-600 volt automatic relay. All switches that control 1,500-volt circuits are thoroughly insulated for this higher voltage.

Protection of the locomotive against short-circuit is very complete. There is one main fuse for the trolley circuit, two fuses for protecting locally the circuits of the pairs of motors and smaller fuses for the auxiliary circuits. The main fuses are of the copper-ribbon type and are fitted with hinged covers to facilitate fuse renewals. All fuse boxes are provided with powerful magnetic blowouts, energized by current passing through the fuse to insure proper rupture of the arc. The main fuse box is located as near as possible to the overhead trolley in order to protect the wiring circuits near the source of supply. An aluminum-cell lightning arrester is also installed in the cab.

The locomotive is equipped with standard luminous arc headlights fitted with semaphore lenses. The brackets and plugs are arranged so that one headlight may be installed on each end or two on either end as desired. Trolley retrievers are used for the pole collectors, and the edge of the cab roof is provided with projecting guard rails to prevent the trolley rope from cutting on the edge or catching in the lamps. The ammeter located at each operating station indicates the current in the circuit of one pair of motors, and with the air gauges is illuminated by a gauge light connected in the headlight circuit, so that the headlight switch turns on simultaneously the headlight and gauge lights in the corresponding ends of the locomotive.

The sanders are pneumatically operated. Sand boxes of ample capacity are located alongside the door in each end of the cab, and the valves are arranged for sanding the track in front of the leading wheels at either end when running in either direction. Ladders for mounting to the roof of the cab are provided alongside the end doors together with grab railings here and at the end steps in accordance with the Safety Appliance Act. The interior of the cab is illuminated by incandescent lamps. Included among these are two portable lamps with extension cords installed at the center in the side passageways. The bell is fitted with an automatic bell-ringer and the whistle is air-operated. All wiring is drawn through conduits and carefully protected from mechanical injury. Two air signals are supplied, one in each end of the cab, to enable the switchmen to signal the engineman.

Automatic Charging Panel for Storage-Battery Lighting Plants.

The great popularity of electric lighting and other uses for electricity has extended to country homes and farming communities, in many of which electric service from a central station cannot be obtained. A considerable number of equipments intended for operation as low-voltage isolating plants driven by gasoline or similar engines, or even by water power, have been installed, but considerable care and skill is required in their operation when provided with a storage-battery auxiliary.

To simplify this matter there has been placed on the market an automatic charging and lighting panel for use with plants of this character employing storage batteries of the lead type. One of the main features aimed at in the design of this automatic charging equipment was to give the battery what is now regarded as the ideal tapering charge, that is, starting at a heavy current which should automatically be gradually reduced to a low rate at the close of the charging period. The charge when fully completed is automatically cut off and the engine and dynamo are disconnected from the battery and stopped, while the lamp circuit is connected so as to be supplied by the battery directly.

The control equipment is so arranged that practically constant voltage can be maintained at the lighting circuit throughout the charge. Thus lamps may be used without being subjected to excess voltage at any period of the charging process. Automatic safeguards are provided for cutting out the battery, if continued discharge should be imposed on it from failure of the generating equipment to give a proper charge. Both the battery and generator are also protected against excessive currents, overspeeding of the engine and other difficulties. During these latter contingencies the lighting circuit is connected direct to the battery so that there is practically no interruption of lighting.

The equipment also provides for electric self-starting of the engine, the generator being used as a motor and operating from the battery to bring the engine up to speed; as soon as this is attained the machine becomes a generator and is ready for charging. An automatic signal and alarm is displayed and sounded when the battery approaches the end of discharge, thus calling the attention of some responsible person to this condition; automatic re-starting of the charging is intentionally not provided so as to compel periodic inspection of the engine, bearings, etc.

The equipment is designed for use with a 16-cell lead battery and with an ordinary shunt-wound generator designed for 42 volts maximum. The principle of operation is shown in Fig. 1. The switches S_1 and S_2 are two parts of a double-pole automatic switch which makes contact with the terminals C_1 and C_2 for charging, as shown, and with the contacts D_1 and D_2 for discharging. The fixed resistance R, usually of one-quarter ohm, is included in the charging circuit, this being so proportioned that with the current used it causes a gradually decreasing voltage drop across its terminals so as to maintain a constant voltage at the lamp terminals, while the voltage across the battery is gradually increasing. Thus the voltage at the terminals of a battery in a typical case, for example, rose from 36.3 volts at the start to 41 volts at the finish of the charging process, during which time, however, the voltage on the lamps varied from only 32.5 to 33 volts. When the charge is completed the automatic switch is thrown over to discharge.

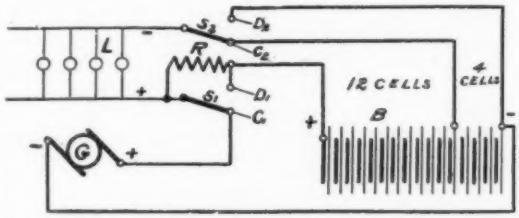


Fig. 1.—Diagram of Connections of Automatic Charging Outfit.

The panel is 18 to 24 inches in out-

side dimensions, and, as shown in Fig. 2, is neatly arranged with two instruments near the top, of which the one at the right is a battery ammeter with zero in the middle, thus reading both charge and discharge currents; the instrument at the left is of similar appearance but is actually a voltmeter and voltage relay with two platinum contact pins. One of these pins, on completion of the charge, makes contact with the needle and causes the automatic circuit-breaker and throw-over switch to open, stopping the discharge and at the same time breaking the ignition circuit of the engine and connecting the lamp circuit direct to the battery. Another platinum pin in this relay instrument makes contact when the battery is discharged and causes the signal and alarm to be actuated. The instrument also serves as a voltmeter, showing the battery voltage throughout the charge and discharge. In the middle of the panel is the automatic switch or circuit-breaker inclosed in an enamel iron case and operating in oil so as to prevent arcing. Pushing the button on the handle of this switch makes a connection from the battery to the dynamo for starting. Directly below the switch and connected with it is a combined overload and reverse-current relay. A push-button for the ignition circuit is also provided for use when it is desired to run the engine for other purposes without charging the battery. In the middle of the bottom of the panel is the handwheel for the field rheostat of the generator. This seldom requires adjustment. Two double-pole fused knife switches are provided, the one at the left being for the battery and the one at the right for the generator. Ordinarily these are not used, since the automatic switch in the middle takes care of practically all operations. These panels are made for batteries ranging from 30 to 250 ampere-hours capacity.

These panels are manufactured by the Roller-Smith Company, 203 Broadway, New York City.

Fig. 2.—View of Automatic Battery-Charging Panel.

The Sattley Coin-Handling Machine.

Dump a miscellaneous lot of coins into the hopper of the machine shown in the accompanying illustration, start the electric motor that drives it, and the machine will sort out the coins into denominations, count them in dollars and cents, wrap them up into standard packages or sack them as you prefer, and also separate the mutilated coins and throw them into a separate receptacle.

Evidently this machine is going to become popular among companies that have to handle small coins in large quantities, such as street-railway companies, gas and electric companies, department stores, tax-receiving offices, water companies, banks, moving-picture theaters, etc. It cuts down the time required to handle money and reduces the cost considerably. It also eliminates errors in counting and prevents pilfering.

The machine is made by the Sattley Coin Handling Machine Company, Detroit, Mich. A Westinghouse small motor is used to drive it.

Motor-Driven Coin-Handling Machine.

Tubular Woven Fabric Company Develops Vacuum Hose.

The Tubular Woven Fabric Company, Pawtucket, R. I., manufacturer of the well known Duraduct flexible conduit, has placed on the market a new vacuum hose which is of a different type of construction, it is stated, from any other hose now available. The hose is designed to be indestructible, inseparable and non-collapsible, the same as Duraduct, and it is also equipped with a molded rubber end. The extreme end of the section which goes over the metal tube is reinforced and so molded onto the fabric that it would appear to be impossible to rupture it in any way. The manufacturer states that the hose has been tested in every possible way and recent tests at Brown University laboratory indicate that the hose stands as nearly a perfect vacuum as it is possible to obtain.

In making the hose the company has endeavored to see how good a hose could be produced rather than making a hose to meet trade prices. The claim is made, however, that the hose is very reasonably priced. The company is already doing a nice business with the hose, which will be known by the trade name of Airoduct.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

ATTACHMENT PLUGS, Fused.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

"Hubbell."

Edison type, 660 watts, 250 volts; catalog Nos. 5,729, 5,754-5,756 inclusive, 5,824-5,826 inclusive, and 5,832. Separable attachment plugs, with bases designed to receive D. & W. type C baby cartridge fuses.

Approved February 24, 1914.

CABINETS. — Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each cabinet.

Approved February 19, 1914.

CABINETS. — Portland Electric Maintenance Company, 121 North Fifth Street, Portland, Ore.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each cabinet.

Approved February 19, 1914.

FLEXIBLE CORD, Portable. (For electric heaters.)—Driver-Harris Wire Company, Railroad Avenue and South Fourth Street, Harrison, N. J.

Double-conductor cord composed of loosely-woven wires with cotton-wind, rubber and asbestos insulations, covered with a braid and assembled as a twin or twisted pair, with and without an extra protecting braid over the whole.

Tag on coil to read: "National Electrical Code Standard."

Marking: One blue and one white thread cabled with the copper strand.

Approved February 18, 1914.

FIXTURES.—L. Erickson Electric Company, 82 Sudbury Street, Boston, Mass.

"Erickson"; for show-case and show-window use. Types for tubular lamps of standard and candelabra size.

Fixtures shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each fixture.

Approved February 19, 1914.

LAMP ADJUSTER.—F. J. Gammache, 207 West Chestnut Street, Lancaster, Pa.

"Gam" cord adjuster.

A wooden block with grooves at each end in which reinforced cord is held by a metal spring fastened to the block.

Standard only for use with approved reinfroced flexible cord.

Approved February 7, 1914.

PANELBOARDS.—H. Krantz Manufacturing Company, 160-166 Seventh Street, Brooklyn, N. Y.

"Krantz Safety Panel" three-wire, 125-250 volt; with an additional slate face which covers the busbars and the special branch-circuit snap switches and through which the switch handles extend. With N. E. Code cartridge-inclosed, Edison-plug or open-link fuse extensions in branch circuits.

Commercial products of this class which are regularly examined and tested under the supervision of Underwriters' Laboratories at the factories where they are produced bear uniform labels by which they can be identified in the field.

Approved February 19, 1914.

PANELBOARDS. — Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.

125, 125-250 and 250 volts.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each panelboard.

Approved February 19, 1914.

RECEPTACLES, for Attachment Plugs.—Chelten Electric Company, 314 Armat Street, Philadelphia, Pa.

"Chelten," 10-ampere, 250-volt flush receptacle; catalog Nos. 5,561, 5,561-A.

Approved February 24, 1914.

RECEPTACLES, for Attachment Plugs.—General Electric Company, Schenectady, N. Y.

Surface receptacles: 10 amperes, 250 volts; cleat, catalog No. 49,488; concealed, 49,489; molding, catalog No. GE064.

Flush receptacles: 25 amperes, 250 volts, catalog No. GE996, with plug 59,197.

Approved February 24, 1914.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." porcelain-shell.

Keyless, 660 watts, 250 volts.

Concealed, catalog No. 490.

Approved February 25, 1914.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Sign sockets: catalog Nos. 274, 279.

Approved February 24, 1914.

RHEOSTATS.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

For starting or continuous duty on circuits of 600 volts or less. Type DE.

Approved February 24, 1914.

SOCKETS, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass shell electrolier sockets.

Keyless, 660 watts, 250 volts; short shell; catalog No. 470.

Approved February 24, 1914, for fixture use only.

SOCKETS, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S.," 660 watts, 600 volts; catalog Nos. 80, 423, 9,366, 43,310, 43,310 "Shurlock" for use with incandescent lamps in series on 600-volt circuits.

Approved February 24, 1914.

SOLDERING FLUX.—L. B. Allen Company, Incorporated, 4519 North Lincoln Street, Chicago, Ill.

"Soldering Stick."

"Soldering Paste."

"Presto Soldering Paste."

Approved February 25, 1914.

SWITCHES, Combination Cutout.—E. H. Freeman Electric Company, Trenton, N. J.

Service cutouts with porcelain base, knife switch and cartridge fuses: 30 amperes, 250 volts; catalog No. 1,804.

Porcelain base switches with Edison plug cutouts: 30 amperes, 125 volts; catalog Nos. 1,814, 1,815 and 1,816.

Approved February 24, 1914.

SWITCHES, Push-button Flush.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Single-pole, five amperes, 250 volts, 10 amperes, 125 volts.

Approved February 18, 1914.

SWITCHES, Surface Snap. — The Perkins Electric Switch Manufacturing Company, Bridgeport, Conn.

(With porcelain covers.)

Single-pole, three amperes, 250 volts, five amperes, 125 volts; catalog Nos. 2,601-2,604 inclusive.

Double-pole, five amperes, 250 volts; catalog Nos. 2,607-2,610 inclusive.

Three-way, three amperes, 250 volts, five amperes, 125 volts, catalog Nos. 2,605 and 2,606.

Approved February 19, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

DERBY, CONN.—The Eastern Engineering & Construction Company has been incorporated, the capital stock being $50,000. W.

AUGUSTA, ME.—The Governor and Council of Maine has authorized the installation of an electrically operated elevator in the State House at Augusta, at a cost of about $4,000. to replace an elevator which is now operated by water power. W.

BOSTON, MASS.—The Clifton Electro Chemical Company has been incorporated with a capital of $40,000. Herbert S. Riley, M. Schuyler Clawson and Thomas M. Smith are the incorporators. W.

HOLYOKE, MASS.—This city is about to replace the arc street lamps on Springfield Road with tungsten incandescent lamps. It is proposed to make a general substitution on all streets of the city in a few months. W.

LEE, MASS.—This town is to install several new street lights. The annual appropriation is $3,950. W.

SPRINGFIELD, MASS.—Engineers of the R. D. Kimball Company, of Boston, will be consulted by the City Property Committee relative to the advisability and practicability of installing a plant for lighting the municipal group.

ATLANTIC CITY, N. J.—Three sets of street-lighting specifications are to be introduced by Director William H. Bartlett before the Board of Commissioners for approval, and as soon as is practicable bids will be advertised for and contracts awarded. Address City Electrician Frank Shinnen for further information.

BELLEVILLE, N. J.—The Town Council is planning for the installation of a new fire-alarm system. Christian Reinhardt is fire chief. A.

CAMDEN, N. J.—The Sterling Switchboard Company has been incorporated with a capital of $125,000 to manufacture switchboards and electrical apparatus. J. S. Low, Fred H. Humphreys, Jr., and William A. Forman, Jr., are the incorporators. A.

HOPE, N. J.—The Patrons' Telephone Company will arrange for the reconstruction of its entire system between Hope and Delaware as a result of the recent storms. A.

SOUTH ORANGE, N. J.—The Township Committee is considering the advisability of the installation of a municipal electric lighting plant. A.

TRENTON, N. J.—The Trenton & Mercer County Traction Company is planning for the extension of its system from Yardsville to Crosswicks. W. H. Hitchcock is general manager. A.

BATAVIA, N. Y.—Batavia Traction Company, Incorporated, has been granted articles of incorporation to build and operate an electric surface railroad. The capital stock is $25,000 and the incorporators are Stephen W. Brown, William F. Haitz and Michael H. Keogh, of this place.

NEW YORK, N. Y.—South Electric Manufacturing Company has been granted articles of incorporation, capitalized at $25,000. The incorporators are L. C. Randolph, C. R. Peddle and W. B. Ligou.

PHILADELPHIA, PA.—The Scofield Engineering Company, Commonwealth Trust Building, has prepared estimates for substation power and transmission for the Savannah Electric Company, at a cost of $200,000. Contracts will be let by the engineers.

PHILADELPHIA, PA.—Plans are being prepared by John T. Windrim for the transmission station to be erected at Germantown Avenue and Moreland Street for the Philadelphia Electric Company. The structure is to be 57 by 100 feet. N.

PHILADELPHIA, PA.—The Delaware & Atlantic Telegraph & Telephone Company is planning for the early erection of a new fifteen-story building on the Philadelphia Parkway, and for improvements in its underground cable system. The latter work is estimated to cost $40,000. H. L. Kinnard is manager of the company. A.

CORINTH, VT.—The Corinth & Newbury Telephone Company has filed articles of incorporation, having a capital stock of $1,500. The subscribers are R. H. Waldow and W. C. Chamberlain, of South Ryegate, and R. E. Burroughs, of Wells River.

SOUTH ATLANTIC STATES.

HOMESTEAD, FLA.—A $30,000 lighting plant will be established here under the supervision of the J. B. McCrary Company.

LEESBURG, GA.—The Albany Power & Manufacturing Company, of Albany, has been granted a 25-year franchise, and will build a transmission line to this city and furnish the street lighting.

WOODLAND, GA.—Citizens are planning to establish electric lighting here. Address the city clerk.

SNOW CAMP, N. C.—The Snow Camp Mutual Telephone Company has been incorporated with a capital stock of $5,000 by D. H. Thompson, James H. Roach and others.

YEMASSEE, S. C.—The Southern Orchard Company will operate an electric-light plant. J. W. Agey is president.

NORTH CENTRAL STATES.

CLINTON, IND.—The Clinton Electric Light & Power Company will soon purchase a 500-kilowatt 2,300-volt three-phase 60-cycle generating unit, direct connected, and a condensing outfit. Address C. M. Poor, superintendent, for further information.

INDIANAPOLIS, IND.—City Civil Engineer Jesup has made public the specifications for the street lighting, bids for which will be received by the Board of Public Works April 20. The contract will be for ten years, taking effect April 1, 1915. There will be a minimum of 2,000 arc lamps and 500 incandescent lamps. In the specifications the arcs called for are ten-ampere alternating-current inclosed flame-carbon lamps.

APPLE RIVER, ILL.—The Warren Light & Power Company has been granted the right to construct and maintain an electric line for the transmission of light, heat and power, within the village.

BLOOMFIELD, IOWA.—Bonds for $15,000 will be issued to rebuild the electric light plant. C.

LYONS, IOWA.—L. C. Moeszinger is a member of a committee to secure ways and means to establish electric lighting.

MUSCATINE, IOWA.—Bids are being asked for the construction of the power plant and for furnishing electrical power to operate the plant in drainage district No. 13. The bids will be opened on April 14. Address Muscatine County Auditor.

KANSAS CITY, KANS.—The capacity of the municipal light plant is to be trebled at once. L. H. Chapman is commissioner of water and lights. M.

WYANDOTTE, MICH.—The Village Board plans to establish a light and water system. Address the village clerk.

COLD SPRINGS, MINN.—Northwestern Telephone Company will erect rural lines to Jacobs Prairie and the Bavarian settlement. C.

ELK RIVER, MINN.—Andrew Davis and C. H. Tyler were appointed a committee to investigate electric lighting for this place. C.

KINGSTON, MO.—The Caldwell County & Southern Railway Company, which proposes to build a nine and one-half mile electric road between Hamilton and this city has been granted a charter to operate in Missouri. David Miller, of Kansas City, is the chief stockholder in the company, which is capitalized at $100,000. Others interested are S. C. Rogers, H. C. Shivley and L. F. Bowman, of Kingston. M.

HARRISON, NEB.—The Town Board has granted a franchise to the Chadron Telephone Company to establish a system in Harrison and connect with the county lines.

OMAHA, NEB.—The Baker Construction Company has filed with the State Railway Commission application to issue $13,000,000 in bonds to finance the construction of the 420 miles of road of the Niobrara, Sioux City & Omaha electric railway. It is believed that authority to issue bonds will be forthcoming. Present plans provide for an electric road between Omaha and Norfolk, by way of Elk City. A branch from Elk City to South Sioux City, from the latter to Niobrara and from Niobrara to O'Neill,

also is proposed with a cross line from West Point to Decatur. C. W. Baker is president of the company. M.

ELLENDALE, N. D.—An electric light plant will be established here this summer. J. L. Tucker of Norwood, owns the franchise.

LISBON, N. D.—Farmers Success Telephone Company has been incorporated with a capital of $10,000. Carl Bliss is named among the incorporators.

CINCINNATI, O.—The management of the Lyric Theater is considering plans and specifications for installing a large electric-light plant in the basement of the theater. Address President Heuck for further information.

DEAN, O.—The residents of this place are considering ways and means to secure electric lighting. Address Theodore F. Kelly, of the Dayton Light & Power Company, Dayton.

MINERAL CITY, O.—The Industrial Power & Light Company, of this place, which has lately been incorporated with a capital of $200,000, will build and operate a large electric power plant for furnishing current to the Federal Clay Products Brick plants of Mineral City. The brick company owns two plants at this point, and two at near-by localities.

NORWOOD, O.—Bids are being asked for all the materials and appliances necessary to properly fit a private power plant for the Boss Washing Machine Company. R.

OAK HARBOR, O.—L. L. Carstensen, clerk of the village of Oak Harbor, will open bids April 15 for the material and construction of an electric-lighting system for the village. Plans on file with Vance L. Grey, electrical engineer, Toledo, O. R.

RAVENNA, O.—The Commissioners have granted this city the right to erect and maintain an electrical transmission line in the township of Rottstown.

TROY, O.—Business men of Pleasant Hill are organizing an electric lighting company to undertake the erection of an electric plant for that village. N. B. Teeter, N. W. Powell, John Myers and others are interested. R.

WYOMING, O.—The Council is planning to erect a municipal electric-light plant after February, 1915, when the franchise now held by the Union Gas & Electric Company, expires. Address the village clerk for information.

DELL RAPIDS, S. D.—The Twin Mound Rural Telephone Company has been incorporated with a capital stock of $2,500, by E. J. Zellmer, T. S. Braa, Henry Haak, Gilbert Braa and S. A. Braa.

AMERY, WIS.—The Amery River Milling Company has been organized here with a capital stock of $40,000, and will generate and sell electric power. Address E. J. Schneider for further information.

BAYFIELD, WIS.—The Municipal Light, Power & Water Company will purchase two direct-current generators; also a motor-driven pump and two switchboards.

BUTTERNUT, WIS.—W. J. Schulze is considering enlarging the electric light plant and lighting the entire city.

MADISON, WIS.—The Railroad Commission gave a permit to the Independent Telephone Company of Blue River to build a line through Grant, Richland and Crawford Counties. C.

SOUTH CENTRAL STATES.

MOBILE, ALA.—The Tidewater Securities Corporation plans to construct a combined aerial and submarine telegraph and telephone line from the mainland at Cedar Point to Dauphin Island.

BARDWELL, KY.—J. Horn and others have organized the Bardwell Home Telephone Company with a capital stock of $1,500, to build a telephone line. G.

BARBOURVILLE, KY.—The Harlan Coal Mining Company, composed of Barbourville and Louisville men, and operating some of the largest mines in Harlan County, is having plans prepared for a large central electrical plant which will probably be constructed early in the summer. Address the general manager.

LEWISBURG, KY.—J. E. Powell and others have organized the J. E. Powell Electric Light Company for the purpose of operating a plant to furnish current to the town. The capital stock of the company is $1,500. G.

LOUISVILLE, KY.—The Louisville Grocery Company will install electric elevators in a five-story building which it is fitting up for its use on Main Street.

LOUISVILLE, KY.—The Cumberland Telephone & Telegraph Company will install equipment extending from Hemlock Exchange to Rossville to cost $20,000.

MIDDLESBORO, KY.—An electric passenger elevator will be installed by Gibson Brothers, who are adding a second story to their establishment. G.

WHITESBURG, KY.—Stephen Combs and others have organized a company for the purpose of constructing an electric power plant for the town. G.

WOODBURN, KY.—The Farmers' Mutual Telephone Company has been organized by V. K. Nicoll and others to build a telephone line. The capital stock is $1,000. G.

DICKSON, TENN.—$15,000 in bonds has been voted to extend the electric and water system. Address the mayor.

BROWNWOOD, TEX.—The City Council has granted a franchise to the Brown Telephone & Telegraph Company to build an exchange here. D.

EMORY, TEX.—The Emory Electric Light & Power Company has been organized here with a capital stock of $2,000 and will erect an electric light plant. The incorporators are G. W. Alexander, J. E. Alexander and K. L. McCormick. D.

SEGUIN, TEX.—The Guadalupe Water Power Company has completed plans for the construction of a great hydroelectric project on the Guadalupe River, which will develop 100,000 horsepower of electrical energy and furnish current for towns and cities within a radius of 60 miles of Seguin, including the city of San Antonio. The project includes the construction of five dams on the Guadalupe River between Seguin and New Braunfels, the erection of a great reservoir on the upper portion of the river with a capacity of 150,000 acre-feet of water, and the hydroelectric plants to generate the power. It is estimated that fully $8,000,000 will have been expended to complete the work. This company has a capital stock of $400,000 and is backed by Dr. E. W. Brown, of Orange, who is president; W. B. Dunlap, of Beaumont, vice-president, and G. M. Abbott, secretary. It is expected to begin actual construction work at once.

WESTERN STATES.

TUCSON, ARIZ.—The dispute between the city of Tucson and the Tucson Gas, Electric Light & Power Company regarding rates and underground conduits has been settled, the company agreeing to take down all electric-light wires and poles on Congress Street, pave between the street car tracks in Congress Street and Stone Avenue, extend its car lines and increase the capacity of the lighting plant, expending about $200,000 on improvements. D.

NEWPORT BEACH, CAL.—Officials of this city have advertised for sale bonds to the amount of $25,000. These were voted in September, 1912, but on account of legal action taken at this time by C. H. L. Ghriest, owner of the only local plant, the sale of the bonds was delayed. The bonds were voted for a municipal lighting plant, but as a 40-year franchise has been entered into with the Pacific Light & Power Company, the money derived from the sale of the bonds will be used in establishing an ornamental street-lighting system. This system will consist of concrete or bronze posts and fixtures and underground conduits. Should the bonds not sell, the system will be built and the district assessed for their payment. T.

STRATHMORE, CAL.—A substation is soon to be erected here for the Mt. Whitney Power Company.

VICTORVILLE, CAL.—Officials of the Southern Sierras Power Company have informed residents of this city that within a few weeks the line which will transmit electrical energy to local people will be constructed. A distributing system will be established here and energy for both light and power will be furnished. Local residents have just been afforded telephone service with the outside world. T.

MALAD CITY, IDAHO.—The City Council has granted a franchise for an electric-lighting system to G. C. McLaughlin, who has announced his intentions of installing a power plant providing the State Utilities Commission, at Boise, will grant him the required permission. O.

BILLINGS, MONT.—The Carbon & Stillwater Electric Railway Company has been incorporated with a capital stock of $75,000 for the purpose of building an interurban trolley line between Red Lodge and Columbus, a distance of 40 miles.

JUDITH GAP, MONT.—Farmers east of the town have organized a Farmers Telephone Company, of which Samuel Riggs is president, and farmers west of town are planning on organizing a company. Mayor H. B. Mills is interested in the project.

SIDNEY, MONT.—The Water Users Electric Company is preparing to construct a telephone line to Lambert. Mr. Kemmis is president. C.

LA GRANDE, ORE.—A. Klees & Son, owners of the electric light plant at Summerville, Ore., recently re-organized as the Klees Water Power Company, and are making preparations and plans for the construction of a large central station and distributing system here, in addition to their present holdings here. A steam power plant is included in the proposed improvement. O.

MYRTLE POINT, ORE.—The Oregon Power Company is making preparations for the rebuilding of its lines in

this city, and in Coquill. The telephone wires the poles now carry will be placed in cables, and the power transmission lines placed on top of the poles. The improvement is estimated to cost approximately $10,000. O.

PORTLAND, ORE.—G. B. Hegardt, engineer, Port of Portland Commission, has been authorized to advertise for bids for five electric winches, costing approximately $2,100 each; a rotary transformer costing about $2,500, and equipment for a power circuit, and other equipment necessary in preparing to use electricity in handling cargo. O.

SANDY, ORE.—The Portland Railway, Light & Power Company recently announced its intention of extending an electric transmission line from Bull Run to this city for the purpose of furnishing light. The cost will amount to about $5,000 and work will be ordered in the immediate future. O.

PROVO, UTAH.—The Utah Power & Light Company has entered into a contract with Provo City providing for the supply of fifty 6.6-ampere 510-watt luminous-arc lamps for street-lighting purposes at $5.50 each per month. U.

BELLINGHAM, WASH.—The Washington Electric Company, a subsidiary of the Stone & Webster Company, recently filed notices with the county auditor of Whatcom County of the appropriation of water power on the Baker River at six different points on the stream. It is understood the company contemplates extensive development work later, but no definite announcements have as yet been made. O.

CENTRALIA, WASH.—The Lincoln Creek Telephone Company recently filed articles of incorporation, naming Eustace Childer, E. Conley, and John Sinclair as incorporators. The new company will maintain a main office here, and will operate in Lewis County. O.

EVERETT, WASH.—The City Commissioners have under consideration the installation of a tungsten lighting system to replace the one now in use. If the new plan carries, additions and extensions to the present system will be made. Address Commissioner Thompson for further information. O.

GLAZIER, WASH.—The Washington Anthracite Coal Company, four miles south of this place, is seeking to secure an official permit to construct a new power transmission line and an expensive aerial tramway at the Lucky Strike Coal mine. Letters applying for permits have been forwarded to the office of the District United States Forester, Portland. Power will be purchased from the Puget Sound Traction, Light & Power Company. O.

SOUTH BEND, WASH.—The City Council unanimously voted to grant an electric light and power franchise to the MacKean interests, which company promises to furnish electricity at the rate of eight cents per kilowatt-hour for lighting purposes, and one cent per kilowatt-hour for domestic purposes. The franchise is combined with a franchise for furnishing the city with water for all purposes at 50 cents per month. A cash forfeit has been placed in a local bank to guarantee the commencement of work on an electric light plant within one year. The city has been guaranteed two per cent of the gross earnings of the Company. Address Frank J. MacKean, here. O.

NEW INCORPORATIONS.

DETROIT, MICH.—C. E. Clements & Son Electric Company has been incorporated with a capital of $20,000.

PITTSBURG, TEX.—The Home Light and Ice Company has been incorporated with a capital stock of $11,000 by Philip Dolinski, W. C. Hargrove and others.

WORCESTER, MASS.—Callahan-Earle Contracting Company has been incorporated with a capital of $3,000. John M. Callahan, William S. Earle and Frank C. Smith, Jr., are named as the incorporators. W.

CHICAGO, ILL.—The Railway Electric Manufacturing Company has been incorporated with a capital stock of $25,000. The incorporators include Max W. Zabel, 53 W. Jackson Boulevard, this city.

CHICAGO, ILL.—The American Burglar Alarm Company has been incorporated with a capital stock of $100,000 to manufacture and install burglar alarms, building protection, etc. The incorporators include Otto P. Ler 4045 N. Hermitage Avenue, this city.

CHICAGO, ILL.—The Palmet Equipment Company has been incorporated with a capital stock of $5,000 to purchase, sell and manufacture railway, power and electric equipment. The incorporators are Elliott S. Rice, Lawrence Palmer-Ball and Miss Effie A. Kelly.

NEW PUBLICATIONS.

CALIFORNIA REPORT.—The report of the Railroad Commission of California for the year ended June 30, 1913, has been published in a volume of 2,005 pages. It contains statistics of the utilities, complaints, orders and laws relating to utilities.

NEW YORK COMMISSION.—The New York Public Service Commission for the Second District has issued Vol. III of the sixth annual report, covering the year 1912. This contains abstracts of the reports of electrical, gas, telegraph and telephone companies.

MAINE COMMISSION.—The fifty-fifth annual report of the Railroad Commissioners of the State of Maine, covering the year ended November 30, 1913, has been issued. It includes statistical tables and petitions, decisions and rules of the Board.

CONSERVATION OF NATURAL RESOURCES.—An article by W. V. N. Powelson entitled "Conservation of Natural Resources," and dealing with the waste involved in the nondevelopment of our water powers has been printed as Senate Document No. 243.

BUREAU OF MINES REPORT.—The annual report of the Director of the Bureau of Mines, Washington, D. C., for the fiscal year ended June 30, 1913, has been issued. It refers to the investigation of the use of electricity in coal and metal mining and the dangers from such use, and to the electric smelting of ores.

ENGLISH TELEPHONE SITUATION.—The Bureau of Public Service Economics has published a pamphlet entitled "What the English People Think of Their National Telephone." It contains correspondence originally published in the *London Times* during December, 1913, dealing with complaints of the telephone service.

TERRESTRIAL MAGNETISM.—The annual report of the Director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, for the year 1913, has been separately printed. It refers to the magnetic surveys of land and ocean areas which have been completed and gives plans of the new building to be erected for the department in a Washington suburb.

NEBRASKA COMMISSION REPORT.—The sixth annual report of the Nebraska State Railway Commission for the year ended November 30, 1913, has come from the press. It contains a general review of the work of the Commission, a list of complaints filed and orders issued, a list of court decisions affecting the Commission, a compilation of reports of utility companies, a tabulation of the physical valuations which have been carried out and a report on the operation of the blue-sky law.

PROPOSALS.

ELECTRICAL WORK.—Bids are being received at the Philadelphia City Hall by the Committee on Property of the Board of Public Education, for the electrical work to be done in the schools of Philadelphia.

WIRING AND ELECTRICAL EQUIPMENT.—Messrs. Baird & Huselton, Kansas City, Mo., are receiving bids for the wiring and installation of electrical equipment in the new Muehlebach Hotel, to be erected on Kansas City at a cost of several million dollars .

ELECTRICAL FITTINGS.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until April 18 for furnishing under Circular 837 cable clips, motors, etc. For further information address F. C. Boggs, Major, Corps of Engineers, U. S. Army, General Purchasing Officer.

ELECTRIC LIGHTING SYSTEM.—Frederick Fries, chairman of the Board of Chosen Freeholders, Camden, N. J., will receive bids until April 8 for the installation of an electric lighting system and power station, as well as a water system, at the tuberculosis hospital, Ancora. Thomas Stephen, Temple Building, Camden, is the architect.

ELECTRIC LIGHT AND POWER SYSTEM.—The Board of Chosen Freeholders, County Courthouse, Newark, N. J., will receive bids until April 15 for an electric lighting and power system installation in the new tuberculosis hospital to be erected at Overbrook. John F. Capen, 207 Market Street, Newark, is architect.

POWER PLANT.—Sealed proposals will be received at the United States Engineer Office, Wheeling, W. Va., for building a fireproof power house and a boiler chimney and furnishing and installing one 115-horsepower boiler, one steam-driven air compressor, two air receivers, one feed-water heater, one feed-water pump, one service pump, etc., at dam No. 12, Ohio River, near Wheeling.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 27 for furnishing interior lighting fixtures of a one-story building for the post office at Cadillac, Mich.; and until April 30 of a one-story building for the post office at Bryan, Tex. Drawings and specifications may be obtained from the office of the Supervising Architect or the custodians of the sites named.

FINANCIAL NOTES.

The Philadelphia Stock Exchange has listed $7,000,000 additional general mortgage five-per-cent sinking-fund fifty-year coupon bonds of the Public Service Corporation of New Jersey.

Kuhn, Loeb & Company has called for 50 per cent payment by members of Western Union syndicate, payable April 1. Something over half of the Western Union stock was subscribed for by stockholders.

James N. Wallace, president of the Central Trust Company, has been elected a director of the Westinghouse Electric & Manufacturing Company, succeeding Thomas W. Lamont, resigned, and H. H. Westinghouse has been elected a director, succeeding the late George Westinghouse.

At the annual meeting of the Guanajuato Power & Electric Company, retiring directors and officers were re-elected. The company, which operates electric properties in the State of Guanajuato, Mexico, reported gross earnings for 1913 of $677,972, an increase of $20,000 over gross for 1912.

Announcement has been made of the absorption by the Reading Transit & Light Company of the Lebanon Valley Electric Light Company interests in Lebanon County. The purchase was made from John S. Weaver, of Lebanon, Pa., who was paid $41,500 in cash and accepted $75,000 worth of common stock in the Eastern Power & Light Corporation, which is the holding company for a number of corporations, including the Reading Transit Company. The Lebanon Valley Company had a capital of $100,000 and several years ago absorbed the Swatara, Bunker Hill, North Lebanon, Palmyra, Lebanon, Hebron, West Lebanon, Myerstown, Jackson and Mill Creek Township companies.

Immediate completion of the Willamette Valley Southern Railway, from Oregon City *via* Beaver Creek, Mulino and Molalla to Mount Angel, and the actual operation of the road before the end of the present year was assured when the Portland Railway, Light & Power Company agreed to guarantee a $700,000 bond issue necessary to finance the project. In consideration for this arrangement the Willamette Valley Southern will purchase its electric power from the Portland Railway and will interchange its traffic with that road at Oregon City. The Willamette Valley Southern already has about seven miles of road completed. The remaining distance can be built with the $700,000 accruing from the sale of the bonds. Under terms of a mortgage filed at Oregon City the road can be bonded for $3,000,000, but this entire issue will not be sold. An outstanding issue of $57,000 first-mortgage bonds will be redeemed by the present issue so that the entire new issue will consist of first-lien securities. The bonds will mature in twenty-five years and pay six per cent. They will be callable at 103 on any interest date.

Dividends.

Bell Telephone Company of Pennsylvania; quarterly of 1.5 per cent, payable April 15 to stock of record April 6.

Central Mexico Light & Power Company; a quarterly preferred dividend of 1.5 per cent, payable March 31.

Chippewa Valley Railway, Light & Power Company; a quarterly common dividend of 1.75 per cent, payable April 1.

Cincinnati, Newport & Covington Light & Traction Company; quarterly of 1.125 per cent on preferred and 1.5 per cent on common, both payable April 15.

City Railway, Dayton; a quarterly dividend of 1.5 per cent on preferred, and two per cent on common, both payable March 31.

Consolidated Cities Light, Power & Traction Company; a quarterly dividend of 0.75 per cent, payable April 1.

Dayton Power & Light Company; quarterly of 1.5 per cent on preferred, payable April 15 to stock of record April 1.

Electrical Utilities Corporation; quarterly of 1.25 per cent on preferred, payable April 15 to stock of record April 1.

Illinois Northern Utilities Company; quarterly of 1.5 per cent on preferred, payable May 1 to stock of record April 20.

Manchester Traction, Light & Power Company; a quarterly dividend of two per cent, payable April 15.

Memphis Street Railway Company; a quarterly preferred dividend of 1.25 per cent, payable March 31.

Nashville Railway & Light Company; a quarterly dividend of 1.25 per cent, payable April 1.

National Gas, Electric Light & Power Company; quarterly of 1.5 per cent on preferred and one per cent on common, payable April 1.

New England Power Company; a quarterly preferred dividend of 1.5 per cent, payable April 1.

Pacific Telephone & Telegraph Company; quarterly of 1.5 per cent, payable April 15.

Western Ohio Railway Company; a quarterly dividend of 1.5 per cent on second preferred, and 1.75 per cent on first preferred, both payable April 10.

Westinghouse Electric & Manufacturing Company; quarterly of one per cent on common, payable April 30 to stock of record March 31, and 1.75 per cent on preferred, payable April 15 to stock of record March 31.

Youngstown & Ohio River Railroad Company; dividend of 0.75 per cent on preferred, payable March 31. This is a reduction of 0.25 per cent from dividend paid December 31, 1913.

Report of Earnings.

NEW ORLEANS RAILWAY & LIGHT.

The New Orleans Railway & Light Company for the year ended December 31, 1913, reports income account as follows:

	1913	1912
Gross earnings	$6,924,425	$6,652,935
Operating expenses, taxes, etc.	4,331,577	3,986,347
Net earnings	2,592,847	2,666,588
Miscellaneous deductions	89,357	101,583
Interest on underlying liens	592,612	602,276
Interest on general mortgages, 4½s	789,480	789,480
Interest on ref. liens	179,050	178,480
Interest on deb. notes.	69,588	.....
Surplus	872,759	995,032

BANGOR RAILWAY & ELECTRIC.

	1914.	1913.
January gross	$ 63,687	$ 58,793
Net after taxes	32,354	29,860
Surplus after charges.	14,996	12,250
Twelve months' gross.	768,979	715,373
Net after taxes	420,068	391,590
Surplus after charges.	212,465	190,354
Balance after preferred dividends	107,465	85,354

Equivalent to 5.4 per cent on common stock.

CHATTANOOGA RAILWAY & LIGHT.

(Subsidiary Tennessee Railway, Light & Power.)

	1914.	1913.
January gross	$ 99,233	$ 95,633
Net after taxes	40,881	36,392
Surplus after charges.	13,228	11,993
Twelve months' gross.	1,208,529	1,079,302
Net after taxes	491,791	433,537
Surplus after charges.	190,456	164,378
Balance after preferred dividends	90,456	64,378

CENTRAL STATES ELECTRIC CORPORATION.

(Cleveland Electric Illuminating Co.)

	1914	1913
February gross	$ 412,903	$ 354,836
Net after taxes	211,045	181,573
Balance after interest, preferred dividends, etc.	173,803	144,560
12 months' gross	4,114,335	3,330,030
Net after taxes	1,987,780	1,559,156
Balance after interest, preferred dividends, etc.	1,575,470	1,167,619

DAYTON POWER & LIGHT.

	1914	1913
February gross	$ 84,055	$ 70,517
Operating expenses	46,367	34,977
Net earnings	37,688	$5,540
Surplus after charges	12,528	12,881
Output, kilowatt-hours.	2,407,091	1,930,726

DETROIT EDISON COMPANY.

	1914	1913
February gross	$ 553,335	$ 467,417
Surplus after charges	175,720	152,923
Balance after depreciation	134,920	112,123
Two months' gross	1,156,661	967,990
Surplus after charges.	392,159	328,172
Balance after depreciation	308,009	244,002

ONTARIO POWER COMPANY.

The report of the Northern Ontario Light & Power Company, Ltd., for the year ended December 31, 1913, shows net earnings of $658,408, an increase of $285,136. The income account compares as follows:

	1913	Increase
Gross revenue	$872,510	$350,905
Operating expenses, maintenance, taxes, rentals, etc.	214,102	65,769
Net earnings	$658,408	$285,136
Interest, etc.	272,263	84,286
Balance	$386,145	$200,850
Dividends preferred	142,758	24,810
Balance	$243,387	$176,040
General reserves	50,000	50,000
Surplus	$193,387	$126,040
Previous surplus	129,652	62,122
Total surplus	$323,039	$188,162

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	March 30	March 23
American Tel. & Tel. (New York)	121¾	122
Commonwealth Edison (Chicago)	139	139
Edison Electric Illuminating (Boston)	255	260
Electric Storage Battery, common (Philadelphia)	52	54¼
Electric Storage Battery, preferred (Philadelphia)	52	54¼
General Electric (New York)	145	147½
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric, common (Boston)	11	11
Massachusetts Electric, preferred stamped (Boston)	61¾	61½
National Carbon, common (Chicago)	108½	109
National Carbon, preferred (Chicago)	117½	117
New England Telephone (Boston)	137	138
Philadelphia Electric (Philadelphia)	26½	26¾
Postal Telegraph and Cables, common (New York)	83¼	83½
Postal Telegraph and Cables, preferred (New York)	69	64¾
Western Union (New York)	62¾	63¼
Westinghouse, common (New York)	75½	77¼
Westinghouse, preferred (New York)	118	118

PERSONAL MENTION.

MR. A. L. POWELL, of the Public Service Corporation, tendered an address on "Lighting" before the City Center Merchants' Association, Jersey City, N. J., on March 26.

MR. NEWTON W. BOLEN, general superintendent of the Public Service Corporation, was a guest of honor at a testimonial dinner given by employees at Paterson, N. J., on March 24, in appreciation of business relations.

MR. DANA PIERCE has been designated by the New York Board of Fire Underwriters to serve as one of its representatives on the Advisory Board of Electrical Engineers for the Department of Water Supply, Gas and Electricity.

MR. C. W. LORING, of the sales department of the Minneapolis General Electric Company, Minneapolis, Minn., recently lectured at the Woman's Club in that city on "Electric Appliances," and has been invited to give another lecture specializing on electric-washing machines and vacuum cleaners.

PROF. MONTRAVILLE M. WOOD, who made the plans for the 500-foot model of the Panama Canal, to be on exhibition at San Francisco in 1915, delivered an illustrated lecture at the high school auditorium in Kansas City, Mo., on March 24, on the use of electricity. Mr. Wood gave a demonstration of the ultra-violet ray, writing on the wall with it in letters of fire. Professor Wood was assisted by his daughter, Miss Aelene M. Wood. The lecture was given under the auspices of teachers in the grade schools of Kansas City.

MR. THURSTON OWENS, until recently vice-president and general manager of the LaCrosse Gas & Electric Company, LaCrosse, Wis., has become secretary and general manager of the San Diego Gas & Electric Appliance Company, San Diego, Cal. The company will install and maintain complete gas and electric equipments in all classes of buildings. Show rooms will be established at 939 Sixth Street, which will be headquarters for gas and electric appliances of the latest and most efficient models.

PROF. HYLON T. PLUMB, of the engineering department of the General Electric Company, with headquarters in Salt Lake City, Utah, delivered a lecture on the subject of "Electricity on the Farm" in the Commercial Club rooms, Twin Falls, Idaho, on Saturday evening, March 21. The lecture was illustrated with lantern slides and was presented in a highly interesting and instructive manner. It was given under the direction of the Jovian League of Twin Falls, of which Mr. H. T. Fulton is president, and H. S. Bates, secretary. Arrangements have been made to have other lecturers discuss electrical subjects before the League in the course of the next few months.

MR. WILLARD DONE, State Commissioner of Insurance of the state of Utah spoke before a meeting of the Electric Club which was held at the Commercial Club, Salt Lake City, on March 26, on the subject of "What the State Is Doing to Protect the Insured." He outlined clearly the relations which exist between the insurance companies, their agents, and the insuring public, and the manner in which the state supervises the placing of insurance so as to protect the interests of all three. He paid a high tribute to the insurance agents doing business within the state, saying that with but few exceptions they are working to the best interests of their policy holders.

MR. CHARLES E. MOSLEY, former treasurer of the Central Group of Bell Telephone Companies, resigned on March 31. Mr. Mosley entered the service of the Bell System April 1, 1889, as manager of the first long-distance line in the West, which connected Chicago and Milwaukee. He was later made district superintendent in charge of the Western District of the Long Lines Department and was chiefly occupied in locating telephone routes through Ohio and in arranging for entrances of the long distance lines into Cleveland, Toledo, Youngstown and other Ohio cities. Mr. Mosley was elected secretary and treasurer of the Chicago Telephone Company, April 1, 1893. He has served under six different presidents of the Chicago Telephone Company, since he came with the company, and he retires from the service of the Bell System with the hearty good wishes and congratulations of his friends in the rounding out of an honorable service covering a period of 25 years.

MR. WILLIAM RUFUS ABBOTT, who succeeds Mr. H. F. Hill as general manager of the Chicago Telephone Company, has been prominent in the business life of Chicago for many years. He was born in New York in 1869, and educated in the public schools. His first position after leaving school was in the auditor's office of the Erie Railroad, which position he filled from 1885 to 1889. He resigned to become cashier of the Westchester Telephone Company, in February, 1889, and in 1890 went with the Metropolitan Telephone & Telegraph Company as order clerk. Both the Westchester and the Metropolitan companies have since been absorbed by the New York Telephone Company. Mr. Abbott went to Chicago in 1893 and became identified with the Chicago Telephone Company, with which organization he has been continuously ever since. He has filled creditably the positions of order clerk, chief clerk to the general superintendent, special agent in charge of rights of way and claims, superintendent of suburban division, and general commercial agent.

MR. ALLARD SMITH has been elected general manager and a member of the Board of directors of the Cleveland Telephone Company. Mr. Smith was born at Eau Claire, Wis. He graduated from the University of Wisconsin in 1898, in the electrical engineering course. In August of the same year he secured a position in the drafting department of the Chicago Telephone Company and has been in the service of the Bell System continuously ever since, filling the following positions: switchboard installer, underground construction inspector, engineer of central-office specifications, chief clerk to the general superintendent, division superintendent of construction, and engineer of outside plant. As division superintendent of construction Mr. Smith built the telephone subway from Chicago to Racine, which is now a part of the subway system connecting Chicago with Milwaukee. When the Central Group of Bell Telephone Companies was formed in 1911, Mr. Smith was appointed outside plant engineer of the Group, his duties having to do with properties in Ohio, Indiana, Illinois, Michigan and Wisconsin. In 1912 he was appointed chief engineer of The Cleveland Telephone Company and the Central Union Telephone Company of Ohio, which position he held at the time of his election as general manager of The Cleveland Telephone Company.

MR. HORACE F. HILL, who has recently been elected vice-president of the Central Group of Bell Telephone Companies, was born in Boston, Mass., in 1860, educated in the public schools and entered the Post Office Department in 1877. During his 15 years in the postal service Mr. Hill rose to the rank of chief clerk in the Boston Post Office. Mr. Hill resigned from the Government service in 1892 to take employment with the American Telephone & Telegraph Company in New York. In 1896 he was appointed assistant general superintendent of the Long Lines Department of that company and was prominent in the development of what is now the long-distance service of the Bell System. In 1903 he was made general manager of the Central Union Telephone Company, with headquarters in Chicago; and was elected vice-president of the Central Union Telephone Company in 1907, retaining also the title and duties of general manager. During the latter year the headquarters were removed to Indianapolis. In 1911 the organization of the Bell System was rearranged and the Central Union Telephone Company became a part of what is now known as the Central Group of Bell Telephone Companies. The group included the Chicago Telephone Company, Wisconsin, Michigan State, Central Union and The Cleveland Telephone Companies, with headquarters in Chicago. Mr. Hill was appointed general manager for the group, in charge of plant, traffic and engineering work. Under another re-arrangement in 1912, Mr. Hill became general manager of the Chicago Telephone Company and the Illinois Division of the Central Union Telephone Company, in which capacity he served until April 1, 1914, when he was elected vice-president, in charge of operation, of the five Central Group companies. Mr. Hill has had a long and honorable service with the Bell System, extending over a period of 20 years, and his advancement is a source of great satisfaction to his many friends throughout the electrical fraternity.

OBITUARY.

MR. CLARENCE B. WIGGINS, assistant general manager of the Delaware & Atlantic Telegraph & Telephone Company, Camden, N. J., died after a short illness of pneumonia on March 18. Mr. Wiggins was a prominent member of the Masonic Order, Elks and the Rotary Club.

MR. HERMAN C. TAFEL, of Louisville, Ky., died suddenly of heart failure at his store last week. Mr. Tafel had been in the electric supply business for the past ten years and had just completed arrangements for the incorporation of his business, capitalized at $75,000. He was a native of Scott County, Ky. He leaves a widow; two sons, Paul and Robert, both of whom are interested in their father's business; and a daughter.

MR. J. H. WALLACE, president of the New York Independent Telephone Company, died suddenly in New York City on March 27. Mr. Wallace tried ineffectually for many years to introduce an independent telephone system in New York City. Prior to his going to live in New York City, he was a prosperous real estate operator in St. Louis. He was also interested in the formation of several independent telephone companies in the West.

DATES AHEAD.

American Institute of Electrical Engineers. Pittsburgh, Pa. April 9-10. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Contractors' Association. First annual convention, Cedar Rapids, April 21 and 22.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17 for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

With the Electrical Manufacturers

Allen-Bradley Company, Milwaukee, Wis., has issued a folder on its Type H motor starter, entitled "Guard the Motor." These starters, which are of the resistance type, are designed to start induction motors.

Belden Manufacturing Company, Chicago, Ill., has issued a little booklet illustrating and describing a number of varieties of clips, tips, terminals and connectors. Sizes and prices are given in all cases. The company also manufactures much similar material to customers' specifications.

Maschinenfabrik Oerlikon, Oerlikon, Switzerland, has issued bulletin No. 78 which describes its motor-driven blowers for medium pressures. These are driven by either direct-current or polyphase motors. Brochure No. 576 is a very completely illustrated pamphlet which describes booster sets for use in connection with storage batteries in central lighting or railway plants. Various types of these machines are illustrated together with their control gear. Many connection diagrams are shown to make clear the manner in which the boosters are used and the way in which the regulating equipment is connected.

The Alberger Gas Engine Company, Buffalo, N. Y., is installing a complete gas engine plant at the factory of Barnhart Brothers & Spindler, Monroe and Throop Streets, Chicago, Ill. The company makes gas engines in sizes from five to 600 horsepower for natural gas, producer gas, illuminating gas, gasoline, kerosene, crude oil and other liquid fuels. A new catalog, describing Alberger tandem horizontal gas engines, is available for distribution. There is also ready for distribution an attractive chart illustrating the horizontal section of the single-cycle gas engine and other gas engines of various characteristics.

Independent Electric Manufacturing Company, Milwaukee, Wis., has obtained the services of H. L. Van Valkenburg, who was formerly connected with the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, as engineer in charge of the rheostat department, in which he developed a large number of devices. Mr. Van Valkenburg later was associated with Allis-Chalmers Company as engineer in charge of the detail apparatus department, and was afterwards chief engineer of the Walker Electric Company, of Philadelphia. Mr. Van Valkenburg will have charge of the engineering department of the Independent Electric Manufacturing Company, and at the present time is giving his attention to a number of new lines which will shortly be put on the market by this company.

Asbestos Protected Metal Company, Beaver Falls, Pa., is marketing a new form of prepared roofing which has been named Aegisroll. The body or base of this roofing is wool felt impregnated by waterproofing and completely enveloped in a coating of asphalt compound. To the upper surface of this base is attached pure asbestos felt, while the lower surface is protected by a coating of crushed quartz. Both the asbestos and the crushed quartz are imbedded into their respective surfaces while the asphalt is hot and they are, therefore, permanently attached. Due to the advancements made by the company in permanently coloring asbestos felt, this roofing can be furnished in a variety of attractive colors, making possible artistic combinations between roofs and the color treatment of the building.

The Garford Manufacturing Company, Cleveland, Ohio, has been organized with a capitalization of $500,000 seven-per-cent cumulative-preferred stock and $800,000 common stock. Mr. Garford has bought $150,000 preferred stock at par and $250,000 preferred stock has been issued to the bondholders of the Dean Electric Company, there being outstanding $250,000 of the Dean Electric Company's bonds. This stock takes up the bonds. Officers of the Garford Manufacturing Company are: President, A. L. Garford; vice-president, A. G. Dean; treasurer, A. L. Patrick; secretary, John Watson; directors are John Sherwin, president of the First National Bank of Cleveland; John Brophy, manager of the Cleveland Automatic Machine Company; attorney, H. H. Johnson, of Cleveland, and E. F. Allen, president of the American Lace Manufacturing Company. The new company proposes to continue to manufacture the products heretofore manufactured by the Dean Electric Company, such as telephone apparatus, automobile horns, etc.

M. B. Austin & Company, 701 West Jackson Boulevard, Chicago, now control the sales and output of the National Electric Company, 149 West Austin Avenue, Chicago, manufacturer of electric utility stoves, electrical sleeping blankets and heating pads, vibrators, electric washing machines, vacuum cleaners and other electric specialties. The city of Urbana, Ill., has ordered 15,000 feet, No. 8 single-conductor, 4,000-volt "Safety" steel-taped cable for series lighting of the city's parks and boulevards. This cable order was sold under specifications prepared by Professor Bryant, of the Illinois State University. Shreveport, La., has bought 9,000 feet, No. 14 two, three and four-wire conductor, "Safety" steel-taped cable to complete a modern fire-alarm system. The Lincoln Park Commissioners have purchased through W. F. Cummings Company, electrical contractors, 37,000 feet No. 6 lead-covered paper-insulated cable, manufactured by the Safety Insulated Wire & Cable Company; 13,000 feet four-conductor, lead-covered paper-insulated cable used in connecting old to the new circuits and 10,000 feet, No. 6 30-per-cent triple-braid rubber-covered wire, used in concrete posts of the extension of the Lincoln Park Commission's lighting system north on Sheridan Road from Foster Avenue to Devon Avenue.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has issued a number of publications, of which one describes

its large meter factory. Views of the different departments in this extensive establishment are shown and the construction of the meters produced is described in some detail. Another publication describes the systematic maintenance of watt-hour meters. This shows and describes at some length proper methods for installing meters and for testing them, pointing out the various adjustments that can be made to rectify errors and also showing a typical testing equipment suitable for this purpose. Another publication deals with electric clocks. These are arranged so that any number of secondary clocks can be controlled from a master clock. The publication shows a large number of fine views of installations of various kinds in which these clocks have been employed. Another publication describes the Santo-Bohner floor-cleaning, polishing and waxing machine. This machine is electrically driven and is particularly designed for use on parquet and linoleum floors. The equipment is made with either direct-current single-phase or polyphase motors ranging up to 250 volts. Other recent publications issued by this company, chiefly in the form of leaflets, deal with a variety of motor-driven equipment for machine tools including planers, boring machines, portable hoisting equipment, centrifugal pumps; others deal with drum-type controllers, field rheostats and regulating equipment, etc. Still another publication describes nitrogen-filled spherical tungsten lamps for use as automobile headlights; these range from 50 to 100 candlepower. The same publication also deals with standard tungsten lamps for similar purposes.

General Electric Company, Schenectady, N. Y., announces the receipt of the following among a multitude of orders: Great Northern Power Company, Fond du Lac, Minn., a 12,000-kilowatt alternating-current generator, 12,000-kilowatt water-cooled transformer and accessories. Mt. Whitney Power & Electric Company, Visalia, Cal., twenty 500-kilowatt transformers. Appalachian Power Company, Bluefield, W. Va., a 345-kilowatt motor-generator set and three 125-kilowatt transformers. Central Iowa Light & Power Company, Fort Dodge, Ia., three 300-kilowatt transformers, switches and accessories. Bergen Point Iron Works, Bayonne, N. J., eight 110 to 125-horsepower mill-type motors with control equipments, 36 smaller motors ranging from 25 to 100 horsepower, 120 two-motor coal-car equipments, 16 transformers ranging from 50 to 425 kilowatts, switchboards, switches, accessories, etc. Atlanta Steel Company, Atlanta, Ga., a 500-kilowatt synchronous motor-generator set and switchboard. Bethlehem Steel Company, South Bethlehem, Pa., 3,000-horsepower induction motor, switchboard and accessories. Pennsylvania Steel Company, Steelton, Pa., a 500-kilowatt motor-generator set. Texas Portland Cement Company, Dallas, Tex., 71 motors ranging from 5 to 500 horsepower, switchboard, controllers and accessories. Dunnellon Phosphate Company, Rockwell, Fla., 15 motors ranging from 50 to 300 horsepower, switchboard, switches, etc. Oklahoma Portland Cement Company, Ada, Okla., a 500-kilowatt Curtis horizontal turbogenerator and a 625-kilowatt alternating-current generator. The Oneida Community, Sherill, N. Y., a 750-kilowatt Curtis turbogenerator. Chicago & Alton Railroad Company, Bloomington, Ill., four 300-kilowatt motor-generator sets, three 150-kilowatt transformers and switchboard apparatus. Boston & Maine Railroad Company, for the plant at the Hoosac Tunnel, three 1,500-kilowatt water-cooled transformers. Upper Hudson Stone Company, Marlboro, N. Y., five motors ranging from 50 to 300 horsepower, three 200-kilowatt transformers and switchboard apparatus. Hebard Cypress Company, Hebardville, Ga., a 750-kilowatt Curtis turbogenerator and switchboard. American Bottle Company, Streator, Ill., a 500-kilowatt Curtis turbogenerator complete with switchboard and accessories. Crescent Portland Cement Company, Wampun, Pa., a 2,500-kilowatt Curtis turbogenerator with switchboard apparatus. Alpha Portland Cement Company, Philadelphia, Pa., four 1,000-kilowatt rotary converters, four 1,050-kilowatt water-cooled transformers and switchboard. Singer Manufacturing Company, South Bend, Ind., two 2,500-kilowatt Curtis turbogenerators with 75-kilowatt turbo-exciters, a 300-kilowatt generator and accessories. New England Box Company, Concord, N. H., 81 motors ranging from one to 50 horsepower, three transformers, switchboard, switches and accessories. Independent Envelope Company, Indianapolis, Ind., a 75-kilowatt generator with exciter, two 5 and six 10-horsepower motors and switchboard equipment. Cherokee Brick Company, Raleigh, N. C., seven motors ranging from 5 to 250 horsepower, transformers and switchboard apparatus. Racine Rubber Company, Racine Junction, Wisconsin, 100 and 200-horsepower induction motors, a 200-kilowatt synchronous condenser and switchboard apparatus. Timber Butte Milling Company, Butte, Mont., 20 motors ranging from 7.5 to 75 horsepower, 5-kilowatt motor-generator set and oil switches. Riverside Portland Cement Company, Riverside, Cal., three 15 and one 200-horsepower motors. Three Forks Portland Cement Company, Trident, Mont., seven motors ranging from 25 to 200 horsepower, two 30-kilowatt transformers, switchboard, etc., Endicott-Johnson Company, Lestershire, N. Y., two 7.5, two 35, and three 50-horsepower motors. American Cement Plaster Company, Acme, Tex., 20 motors ranging from 3 to 25 horsepower, with switches, etc. International Portland Cement Company, Spokane, Wash., two 150-horsepower motors and starting compensators. Crescent Portland Cement Company, Wampum, Pa., 200-horsepower, 480-volt synchronous motor.

Record of Electrical Patents.

Issued by the United States Patent Office, March 24, 1914.

1,090,841. Electropneumatic Brake System. J. S. Doyle, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. Brakes are applied upon grounding the circuit through brake valve, controller or conductor's cord.

1,090,868. Printing-Telegraph System. F. R. McBerty and A. H. Adams, assignors to Western Electric Co. Electromagnetic means for printing the messages.

1,090,872. Electrical Conductor. P. P. Nungesser, assignor to Nungesser Carbon & Battery Co., Cleveland, O. Flexible metallic pigtail connection clamped to carbon brush. (See cut.)

1,090,877. Vibrating Circuit-Breaker. P. M. Rainey, assignor to Western Electric Co. An interrupter comprising an induction coil and a contact-making armature.

1,090,887. Binding-Post for Electric Terminals. A. B. Simpson, Jersey City, N. J. Has metal strip to cap carbon electrode of dry cell.

1,090,888. Connector for Electric Wires. A. B. Simpson. Binding-posts hold wires between folds of metal strip.

1,090,894. Internal-Combustion Engine. L. E. Viard, Bar-sur-Seine, France. Electric ignition by spark plug on head of piston and terminal on cylinder head.

1,090,872.—Pigtail for Brush.

1,090,902. Electrical Valve. J. W. Beckwith, Spokane, Wash., assignor of one-half to H. A. & L. D. Holland Co. An electromagnetic valve-operating mechanism.

1,090,907. Pneumatic-Dispatch-Tube System. F. E. d'Humy, assignor to Western Union Telegraph Co. Contact device in tube operates timing device for motor-control switch.

1,090,909. Primary Battery. E. G. Dodge, assignor, to New Jersey Patent Co., West Orange, N. J. Covers arrangement of electrodes in Edison-Lalande cell.

1,090,910. Scraping Machine. A. H. Fargo, West Newton, Mass. Includes motor-driven scraper.

1,090,917. Electric Ignition System. T. Hubert, C. and C. E. Lockwood, said Hubert assignor to American Circular Loom Co., Portland, Me. Comprises generator, transformer, spark plugs and means for short-circuiting transformer secondary on opening generator circuit.

1,090,919. Well-Boring Apparatus. I. Kitsee, Philadelphia, Pa. Includes electric drive and electromagnetic feed and clamping means.

1,090,920. Means for Assembling Cores of Dynamo-Electric Machines. E. R. Knight, assignor to Allis-Chalmers Mfg. Co. Covers mechanical means for pressing core into yoke.

1,090,924. Electric Cooking Apparatus. J. Lawrence, London, England, assignor to Electric Heat Storage Co. An electric grill with heating element imbedded in ribs of heat-storage mass.

1,090,926. Electroplating Apparatus. G. A. Lutz, assignor to American Circular Loom Co. Articles to be plated are held by rings on the cathode.

1,090,929. Lamp-Fixture. H. D. McFaddin, East Orange, N. J. A lamp bracket for bed-posts, etc.

1,090,930. Electric-Lamp Socket. R. R. McIlvaine, Wilkinsburg, Pa. A key socket in which sections of the body are held by a coiled spring. (See cut.)

1,090,983. Electric Lamp. E. A. Hawthorne, Bridgeport, Conn. Battery and lamp with locking control by rotatable cap.

1,090,989. Electric Sign. G. T. Kelly, Chicago, Ill. Endless chain makes and breaks contacts for lamps.

1,090,990. Electric Transmission of Energy. I. Kitsee, assignor to American Telephone & Telegraph Co. Covers means for simultaneously transmitting telegraph and telephone messages over the same line.

1,090,992. Gas or Vapor Electric Lamp. R. Küch, assignor to General Electric Co. A mercury-vapor lamp with two mercury reservoirs.

1,091,003. Electrically - Controlled Elevator. T. G. Mason, Toronto, Ont., Canada. Includes push-button control from floors.

1,091,012. Electrical Switch Mechanism. R. W. Pachaly, Chicago, Ill., assignor of one-half to T. H. Garland. Includes electromagnetic control of dynamo in axle train-lighting systems.

1,091,014. Cigar-Lighter. G. F. Paldani, Waukegan, Ill. Provides electric ignition.

1,091,021. Electric Ignition-Fuse. K. Schaffler, *rekte* Glössl, Vienna, Austria-Hungary. Conductors short-circuited upon ignition.

1,091,022. Candy-Making Machine. P. H. Schlueter, Chicago, Ill. Has motor drive.

1,091,038. Signaling Device. S. Chase, Los Angeles, Cal. Electromagnet moves an arm located in front of the bull's-eye.

1,091,046. Coil for Electrical Purposes and Method of Producing Same. E. A. DeWolf, assignor to J. R. Leeson, Boston, Mass. Layers of yarn protect ends of coil.

1,091,098. Electric Hammer. B. Valiquet, Chicago, Ill. An electric motor drives operating cam.

1,091,102. Railway Signaling Apparatus. B. F. Wooding, Denver, Colo. Covers contact device for electrical signals to engine cab.

1,091,127. Wireless Receiving Apparatus. R. R. Goldthorp, Hartford, Conn. Condenser, detector and connecting wires inclosed within tuning coil.

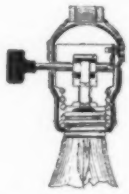
1,091,133. Block-Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co. Automatic system employing a two-phase system of track relays, power being obtained from three-phase source.

1,091,134. Normal - Danger - Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co. Automatic single-phase system employing track relays.

1,091,153. Electric Clock. J. J. Moore, Chambersburg, Pa. Electromagnet supplies energy to balance staff.

1,091,155. Electric Switch. T. E. Murray, New York, N. Y. A box-inclosed switch with box-locking means.

1,091,159. Transmitting Apparatus for Electric Signaling. P. O. Pedersen, Copenhagen, Denmark. A con-



1,090,930.—Lamp Socket.

tact-making device with auxiliary contacts to prevent sparking.

1,091,185. Anode and Anode-Hook. H. R. Boissier, Great Neck, N. Y. For an electrolytic apparatus.

1,091,193. Telephone-Exchange System. E. E. Clement, assignor to F. C. Stevens, Attica, N. Y. An automatic telephone system.

1,091,222. Method for the Electrical Production of Light. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A mercury-vapor lamp with conducting projection to reduce the cathode resistance.

1,091,223. Apparatus for Operating Vapor Converters. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. A single-phase mercury-vapor rectifier with means for obtaining four phase currents.

1,091,225. Protection of Feeders of Electrical Distribution Systems. P. V. Hunter, Heaton, England. A circuit-

1,091,244.—Mercury Rectifier.

breaker actuated by two balancing transformers controlled by balancing strands.

1,091,226. Electrical Socket and Receptacle. L. Kellner, New York, N. Y. Covers details of the key switch.

1,091,242. Direction - Indicator for Electro-Mechanical - Telegraph Systems. W. K. Queen and T. F. Pickett, Needham Heights, Mass., assignors to Q-P Signal Co. Includes wrong-direction alarm apparatus.

1,091,244. Electrode for Gas or Vapor Electric Apparatus. M. von Recklinghausen, assignor to Cooper Hewitt Electric Co. A mercury-vapor converter having a number of positive electrodes with an intermediate negative electrode. (See cut.)

1,091,255. Chain Links. H. Taylor, Chicago, Ill. The links have connected channels for the electric wires leading to the fixture lamps.

1,091,256. Electrical Distribution System. P. H. Thomas, assignor to Cooper Hewitt Electric Co. A series motor has a mercury-vapor rectifier shunted across the motor field to take the discharge when the field circuit is broken.

1,091,295. Spark Plug and Air Compressor. D. B. Combs, Waverly, O. A collar mounted on the base has pockets for controlling valves.

1,091,382. Apparatus for Sterilizing Liquids by Means of the Ultra-Violet Rays. T. Nogier, Lon, France. A special casing for holding a quartz-tube mercury-arc lamp.

1,091,420. System of Regulation for Dynamo-Electric Machines. V. G. Apple, assignor to Apple Electric Co., Dayton, O. An electromagnetically controlled rheostatic regulator for the shunt field.

1,091,451. Ignition Plug. A. R. Bullock, assignor to A. J. Hudson, Cleveland, O. A spark plug with spiral passage to impart a whirling motion to the gases.

1,091,465. Signaling System. F. B. Adam and L. H. Arens, assignors to Frank Adam Electric Co., St. Louis, Mo. A combined switch and circuit-closing device for controlling any one of a group of circuits.

Reissue No. 13,704. Heat-Dissipating Means for Electrical Apparatus. H. A. Rhodes, assignor to Universal Motor Co., Denver, Colo. Original No. 981,690, dated Jan. 17, 1911. A spool has sheet-metal foil interposed between layers of the coil, the extremities of the sheets being slit and bent into engagement with the spool.

Patents Expired.

The following United States electrical patents expired March 30, 1914:

579,556. Multiple-Series Electrical Distribution. F. B. Badt, Chicago, Ill.

579,582. Electric Meter. G. Hookham, Birmingham, Eng.

579,611. Electric Heater. W. R. Smith, Manchester, N. H.

579,633. Telegraph Transmitter. C. L. Buckingham, New York and J. Gardam, Brooklyn, N. Y.

579,634 to 579,636. Printing Telegraph. C. L. Buckingham, New York and E. Germann, Brooklyn, N. Y.

579,699. Microphone. A. W. S. Davis, Lowell, Mass.

579,707. Electrical Generator. S. V. Essick, Yonkers, N. Y.

579,725. Insulator and Holder for Electric Railways. W. C. Keithly, San Francisco, Cal.

579,728. Trolley System. W. H. Walker, Pittsburgh, Pa.

579,738. Method of Overcoming Electrical Phenomena in Goods, Etc. B. W. Child, Boston, Mass., and M. A. Replogle, Cedar Falls, Iowa.

579,759 and 579,760. Electric Railway. F. Mansfield, Philadelphia, Pa.

579,780. Electrical Governor for Marine Engines. G. A. Tower, Richmond, Va.

579,790. Mouthpiece for Telephone. C. L. Cohn, Boston, and M. Martin, Malden, Mass.

579,877. Mold for Manufacturing Secondary-Battery Plates. F. King, London, Eng.

579,916. Battery Cover. H. J. Brewer, New York, N. Y.

579,929. Electrically Controlled Railway-Signal. F. McBrien, Newark, N. J.

579,933. Signaling. J. G. Schreuder, Edgewood Park, and J. P. Coleman, Swissdale, Pa.

Electric Vehicle Section

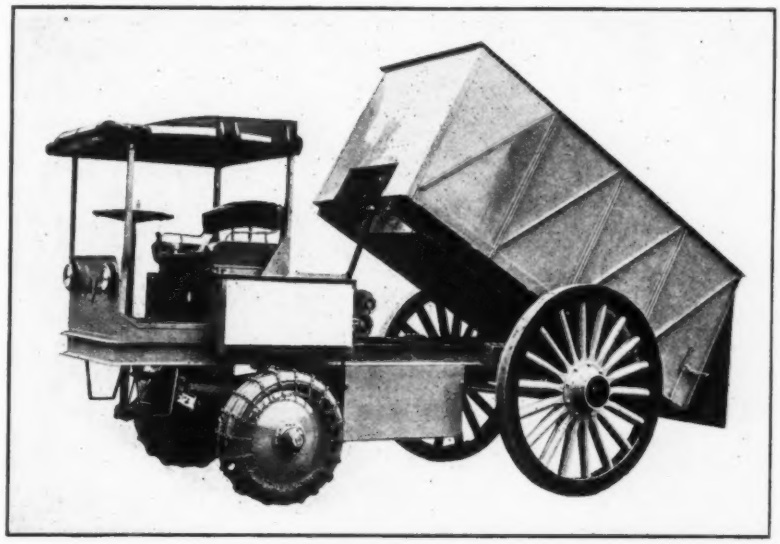
Influence of Motor Characteristics on Operation of Electric Trucks.

At the March meeting of the Electric Vehicle Association of America, T. H. Schoepf, of the Westinghouse Electric & Manufacturing Company, delivered a paper entitled, "The Performance Characteristics of Electric Motors and Their Influence on the Operation of Electric Trucks." Mr. Schoepf's paper treated of the adaptability of the magnetically-saturated and the magnetically-unsaturated motors for motor-truck service.

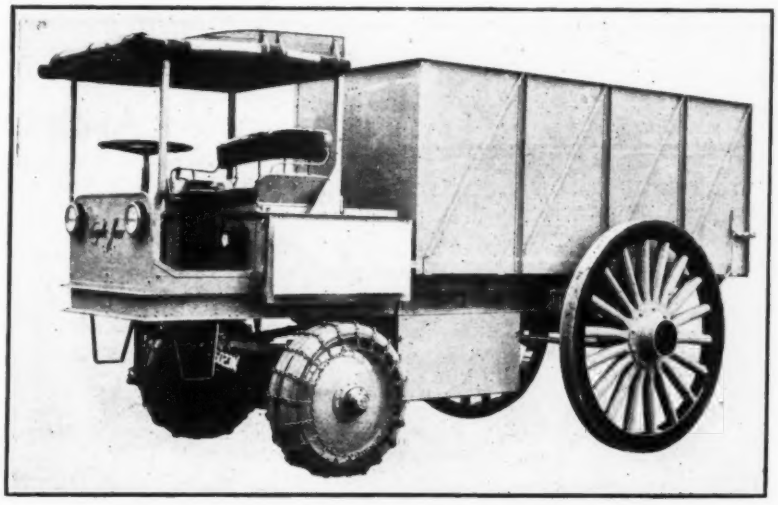
In the first part of the paper he discussed the operating characteristics of both types of motors on overloads, calling attention to the higher torque ratio obtained with the unsaturated motor and the higher speed ratio obtained with the saturated motor. Considering two motors of equal rating, the saturated motor when required to work on overload will take a heavier current than the unsaturated motor under the same conditions but will drive the car at a higher speed. Particular stress was laid on the fact that a motor that will give satisfactory service in one city, may fail to do so in another. A saturated motor may easily become unduly loaded (and probably burn out) in a city having considerable grades or bad weather conditions in winter. Particular attention should, therefore, be paid to motor selection because of the difficulty of producing well-proportioned and well-designed saturated and unsaturated motors within the same frame. Mr. Schoepf refrained from expressing a preference for either type of motor and merely emphasized his belief that satisfactory saturated and unsaturated motors cannot be made within a single frame. His curves and figures, however, show that the unsaturated motor is in general more economical to operate and has a less relative heating current than the saturated motor on overload.

New Electric Dumping Coal Car.

In the two accompanying illustrations is shown a new model of an electric self-dumping coal car. Its capacity is seven tons and it has front drive of the Couple-Gear type. The driving wheels are of the special type A pattern and embody the latest ideas in this class of drive. The rear wheels are 67 inches in diameter and have a six-inch by 1.5-inch two-part steel tire. The spokes are four inches and the axle is of the Timken roller-bearing type. About 85 per cent of the live load of the car is carried on the rear wheels.



Dumping Coal Car Built by Couple-Gear Freight Wheel Company.



Electric Self-Dumping Coal Car—Bin at Rest in Chassis.

The battery equipment consists of 44 cells, each with 31 plates; the cells are bolt connected. The average speed of the car on ordinary city streets is about seven miles per hour.

The dumping mechanism is operated by a motor through a telescopic screw controlled from the driver's seat. As soon as the body of the wagon has been raised a certain distance the rear end door opens automatically, allowing the coal or other contents to be quickly dumped. The body is entirely of steel. The entire construction is similar to that of the

Couple-Gear cars that have been in use in Boston for about four years; but in the new model springs are also provided for the rear axle. The front spring suspension consists of two half-eliptic and the rear spring suspension has two quarter-eliptic and two half-eliptic springs; of these one is in front and the other at the rear of the axle.

The car is made by the Couple-Gear Freight-Wheel Company, Grand Rapids, Mich.

Electric Battery Vehicles.[1]

The importance to the central station of the load to be obtained by a general use of electric vehicles can hardly be over-rated. It is in practically all cases an "off-peak" load; and as it will in nearly all cases come on during the night, when the majority of the other consumers have ceased to make any demand on the supply, it will have a tendency to flatten out the generating station load curve in a most favorable manner. Every central-station engineer knows the beneficial effect that such an improvement in the station load-factor will have upon the cost of generation, rendering it possible to reduce the selling price to all consumers, and, by the increased demand thereby created, greatly benefiting the electrical industry generally. Little wonder, therefore, that the central-station engineer, now fully appreciating these possibilities, is keen on doing all that he can to popularize the electric vehicle and to facilitate its adoption. The natural outcome of this keenness was the formation, by the Incorporated Municipal Electrical Association, of the Electric Vehicle Committee. The object of this committee is to promote the adoption and use of the electric vehicle for business and pleasure purposes, and its constitution is framed on co-operative lines. The majority of its members are outside the Incorporated Municipal Electrical Association and consist of representatives of the electric manufacturing interests, the electric power companies, the electric vehicle manufacturers and agents, and others.

At the moment, the most promising opening for the electric vehicle appears to lie in its use for commercial purposes; but it is by no means improbable that the passenger-carrying vehicle, whether for business or pleasure purposes, will not eventually be considered from the central-station point of view almost as important as the commercial type of vehicle.

One frequently meets people—some of whom, unfortunately, are engineers—who, at the mere mention of an electrically-driven vehicle deriving its energy from a storage battery, grow sceptical, openly expressing their doubts as to the possibility of such a method of road traction ever proving commercially successful. They apparently base their opinions upon the failures of past years. It cannot be too strongly emphasized, however, that the electric vehicle of today is not to be judged by the experience of even a few years ago in this country. Since that time, great advances have been made in storage-battery construction, the design of the motors for electric vehicles has been improved, ball and roller bearings have been brought to a high pitch of perfection, chassis construction has been lightened, and better and more efficient rubber tires can be obtained. For the improvements in the latter three items, the electric vehicle owes much to the wonderful evolution of the petrol car in the past few years.

If we have to admit that there are limits to the scope of usefulness of the electric vehicle; if we have to concede to the petrol vehicle, as we certainly must, some of the merits that it is known to possess; if we must agree that there are certain fields that the latter will probably continue for some time to hold as pre-eminently its own; it is nevertheless true that within its own legitimate sphere the electric vehicle can show a degree of economy, and a record for reliability,

1 Introductory notes by F. Ayton, secretary, Electric Vehicle Committee, England, on the occasion of a discussion at the Institution of Electrical Engineers, London, on March 19.

Twice Around the World.
And Starting the Third Lap 10% above Rated Capacity
Truck No. 37 of the Chicago Commonwealth Edison Company has been operated constantly for 4 years and has traveled over
50,000 Miles—
Equivalent to twice around the earth
The Edison Battery is Guaranteed for 4 years to be Capable of Developing Its Full Rated Capacity
The original Battery of 60 A-6 Edison cells installed in Truck No. 37 in 1909 with a rated capacity of 225 ampere hours is still operating it and gave on bench test a few weeks ago 247½ ampere hours. During the four years the Electrolyte was renewed twice. There were no other renewals or repairs of any kind on the battery. Another Edison Storage Battery in similar service is just entering its sixth year.
Mr. Edison is still waiting for a properly installed Edison Battery to show signs of giving out.
EDISON STORAGE BATTERY CO., 105 Lakeside Ave., ORANGE, N. J.

Take St. Louis for instance

The Anheuser-Busch Brewing Association, of St. Louis, one of the largest breweries in the United States, operates 50 electric trucks equipped with "Exide" Batteries. This is what the company recently wrote regarding "Exide" Batteries:

"We are getting excellent service out of our "Ironclad-Exide" and "Hycap-Exide" Batteries. We are not having any trouble with batteries. We have had very heavy deliveries this past summer and not once did our batteries fail us. We have at this date about 50 of your batteries in service. All I can say will not praise them enough for their excellent service."

The Union Electric Light and Power Co., of St. Louis, operates 19 electric vehicles equipped with "Exide" Batteries, 10 of them being "Ironclad-Exide".

The Commercial Truck and Mail Service Co., at St. Louis, which hauls United States mail, has 9 "Electrics" equipped with "Hycap-Exide" Batteries.

The Board of Education of the City of St. Louis uses 4 electric vehicles equipped with "Ironclad-Exide" Batteries.

The Krey Packing Co., of St. Louis, also operates 4 "Electrics" equipped with batteries of the "Exide" types.

And there are many other commercial "Electrics" as well as hundreds of pleasure cars in St. Louis which use either the "Exide", "Hycap-Exide", "Thin-Exide" or "Ironclad-Exide" Batteries.

75% of all electric trucks in St. Louis are equipped with "Exide" Batteries.

Central Stations interested in increasing the use of Electric Vehicles will find it pays to endorse the "Exide" Batteries.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of The "Chloride Accumulator", The "Tudor Accumulator" The "Exide" "Hycap-Exide" "Thin-Exide" and "Ironclad-Exide" Batteries.

New York Boston Chicago **PHILADELPHIA, PA.** Denver San Francisco Seattle
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with which no other existing type of vehicle can hope to compete. We shall, I think, be wise if we frankly admit the probability that each type of vehicle will have its own distinctive field of use in which it will prove, on the score of suitability and economy, practically unassailable.

In spite of the fact that it has to provide and maintain its own roadway, and that this accounts for by far the greater part of the total capital expenditure, the average cost of operating electric tramcars in this country indicates that this method of transit is still the cheapest where the traffic to be catered for warrants the outlay. The trolley omnibus, again, has proved a cheaper means of conveyance than the petrol omnibus, in spite of having to bear the additional capital charges of the trolley line and feeders. Both these examples are only instances, out of many, showing that when electric driving can be suitably applied and combined with the supply of electrical energy from a central station, the results as regards convenience, economy, and reliability, are incomparably superior to those of the small independent power plant.

The electric battery vehicle is only another instance of the same kind. It also draws its energy from the central station—not continuously, I agree; but it is able to take it at times which are very convenient to the supplier, and under conditions that properly allow of a low price per unit being charged. There is certainly a loss in charging and storage, but in comparison with the electric tramcar and the trolley omnibus, this loss can to some extent be set off against the loss in transmission connected with the two latter systems.

I think that these analogies, together with the well-known simplicity of the electric vehicle, its freedom from vibration, and the consequent lessened wear and tear, will go far to explain and make clear to the layman the reason why it proves in actual service to be so economical and reliable.

The position of the electric vehicle can hardly be considered apart from methods of charging its battery. With the batteries at present fitted, the impressed voltage required towards the end of the charge is in the neighborhood of 110 to 120 volts. Since the supply pressures in use are generally above 200 volts, it follows that in most cases the charging must be done through the medium of some pressure-reducing apparatus. If the use of the electric vehicle is to reach the proportions that we so ardently desire, it is essential that the charging operation should be made as simple as possible; in fact, it should be made—as it can be made—practically automatic. It therefore remains for the central-station authorities and the manufacturers to see that reliable automatic apparatus is provided. It should be so constructed that when the correct terminal voltage for the whole battery (which is a good approximate indication of the battery's condition) has been reached, the motor-generator is automatically shut down. It is of great importance that vehicles should be able to run into any place where charging facilities are provided, and get connected up with ease. This points to the necessity of standard charging receptacles and plugs. The Electric Vehicle Committee, realizing the importance of this, have decided after careful consideration to recommend to the British Engineering Standards Committee the desirability of adopting the 150-ampere plug and receptacle of the Electric Vehicle Association of America as the standard fitting for this country. The American Association has standardized upon two sizes, 50 amperes and 150 amperes, but we came to the conclusion that, as the larger size would be required for most vehicles, it was desirable to keep to that alone.

Electric Traffic Regulator.

There has been demonstrated in London a patent traffic regulator device enabling the motorist to signal to following cars without taking his

Steering Wheel Equipped with Direction Indicators.

hand off the steering wheel. The steering wheel has two operating switches. Instead of holding out the hand when turning a corner, a block knob on the steering wheel is turned for the direction in which the driver wishes to go, and at once there appears on the regulator a white arrow on a red field which indicates to the following traffic avoiding collisions, etc. The Simms regulator is made either in one unit or in two. The device can be fitted to the hood hinges at the side of the back of the car. The electric wiring and arrangements of switches are simple and of neat appearance—damp, dust and fool proof. If desired two extra switches can be fitted at the bottom of the steering pillar operating the regulator automatically when the steering wheel has been turned through an arc of 20 degrees either side, this giving an additional indication of the turning car automatically. The current required is taken from a small battery, and the regulator can be fitted to any car in half an hour.

The regulator takes the place of the red rear-light. This equipment is manufactured by the Simms Motor Units, Ltd., 191 Wardour Street, London, W., England.

New England Section, Electric Vehicle Association.

The March meeting of the New England Section, Electric Vehicle Association of America, was held March 25 at the offices of the Lynn Gas & Electric Company, Lynn, Mass. About 55 members were present, a number coming from Boston.

Sewall Cabot, of the Electric Conversion Company, Boston, an expert in wireless telephony and X-ray machinery, exhibited and described a new rectifier of the mechanical type which he has devised for electric-vehicle service. The apparatus is of the rotary type: the field is the revolving part and is operated by a synchronous motor. Mr. Cabot claimed for it an efficiency 12 per cent greater than that of a mercury-arc rectifier and 15 per cent greater than a motor-generator. The new machine exhibited is said to run on 100 amperes with 96 per cent efficiency, and on 20 amperes with 80 per cent.

J. C. Clendennin, of the General Electric Company, questioned Mr. Cabot on various phases of the apparatus, and J. S. Codman and others took part in the discussion.

The Effect of Power-Wagon Operation on Terminal Freight Congestion.

An important paper, "The Effect of Power Wagon Operation on Terminal Freight Congestion," is to be given on April 24, by Fred A. Hortter, car accountant, Boston & Maine Railroad System, before the Electric Vehicle Association of America at its headquarters in the Engineering Societies Building, 29 West Thirty-ninth Street, New York City.

Mr. Hortter's paper is based on extended investigations conducted over a period of more than five years in both railroad and steamship fields. Inasmuch as the study of freight congestion at railroad and steamship terminals has been approached by a practical operating railroad executive, who is concerned in the solutions of the problems, rather than the particular machinery required, the findings will have particular value.

A large attendance at this meeting is expected; and a number of prominent operating railroad and steamship officials will take part in the discussion which will follow the presentation of the paper.

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Electric Vehicles for Parcel-Post Service.

The Electric Vehicle Association of America is co-operating with the National Electric Light Association in the promulgation of a campaign of education with respect to the utilization of electric vehicles in parcel-post delivery service. In this connection the assistance of the Post Office authorities at Washington, local postmasters, representatives and United States senators, manufacturers of vehicles and accessories and central-station managers is being secured. Under the joint auspices of these two organizations a booklet has been published entitled "The Electric Vehicle in Parcel-Post Service for Economy and Reliability." This booklet outlines the proposition of rendering to the Post Office department authorities such collaboration as will enable them to recognize the value which has been accredited by the most conservative business organizations throughout the country to the electric vehicle as a transportation utility in city services. It discusses also the problems of the parcel-post delivery, the dependability and efficiency of electric-vehicle service, the extent to which investment has already been made in electric vehicles, the co-operation that is now available and that may be expected from the central-station interests of the country, and the relation of the present cost under the contract haulage system to what may be accomplished with electric-truck service. The experience of New York City in electric parcel-post deilvery and that of Indianapolis are discussed.

With respect to the problems of parcel-post delivery the booklet states:

"The selection of the equipment to be employed for parcel-post purposes should be made with caution against undue novelty, experiment or unknown risk, if efficient and uninterrupted service is to be assured; and the possible scope for extension is so broad as to warrant only the employment of working equipment which has been demonstrated successful elsewhere in similar operations. The vehicular transportation of this class of mail matter in its collection, transfer between railroad stations and postoffice substations, and delivery to its final destinations embraces one of the most serious and difficult problems of the entire undertaking, yet this may be resolved into practical and economical accomplishment by bringing to bear upon it the variety of experience accumulated elsewhere in performances having similar characteristics.

'One of the purposes in view is to make known the many and particularly interesting reasons, not yet fully appreciated, as to why the electric vehicle has superior advantages over any other type of vehicle for transportation purposes within the limitations of city and suburban service, as distinguished from either long-distance service or rural delivery. The electric type of machine has been evolved under the most rigorous and exacting service during the past fifteen years, and as a successful device in quantity installations for commercial purposes has commanded the endorsement and the investment of the merchant community to a greater extent than any other kind of motor vehicle. Large installations of such vehicles exist in all the principal cities of the country and their economical performance has instilled such confidence among those conversant with their capabilities as to put them in that class of stable industrial apparatus in which permanent investment to any extent is warranted without the risk of their being superseded or radically changed beyond a rational and gradual improvement.

"Wherever they have been installed within the field of their rational application they have not only remained, but by influence of their economy have forced increase in their number. For some years they have been successfully employed in considerable numbers by many government departments, such as the Navy Department, Treasury Department, Government Printing Office, the Insular Bureau, and by some contractors in the service of the Post Office Department.

"An approximation of the value of some of these large investments is as follows:

Express and transfer companies	$3,010,000
Public service companies	3,671,000
Department stores	5,627,000
Packing house organizations	609,000
Brewers	5,350,000
Wholesale merchants and manufacturers	2,088,000
United States Government service	435,000

"As to the direction in which practical co-operation can be effected between the committees of the associations mentioned above and those of the Postoffice Department having parcel post operations in charge, it may be pointed out that, having no specific scheme to prosecute and being interested primarily in promoting a justified disposition on the part of the Department to prefer the application of electric vehicles within the range of their capabilities, the association committees stand ready to co-operate in furthering whatever policy or practice may be determined upon by the Department.

"With the establishment of electric vehicle installations in the various cities of the country the Department would be assured that the local public-service electricity-supply companies can exert a particular fostering influence to insure the successful, uninterrupted and economic services of these installations whether they are owned and operated by contractors or owned and operated by the Department, and should the policy of Department ownership be determined upon, this local co-operation would be the greatest possible insurance which the Department could have against whatever risk might be incurred.

"Probably the co-operation of these two associations might be very desirable to the Department in the possible educational influence which they could exert among all interested.

"If the continuation of the existing contract method of securing transportation service should be the final decision of the Department and presuming that the use of electric-motor vehicle equipment is preferred, the co-operative efforts of these associations could be of particular value in furthering plans by which the contractors could secure and successfully employ such equipment."

President Frank W. Smith has appointed a special committee on parcel-post delivery. The chairman, James H. McGraw, president of the McGraw Publishing Company, New York, has already inaugurated the campaign and several meetings have been held with a view to mapping out the most effective way of accomplishing the purpose of the organizations. Other members of the committee are C. A. Terry, vice-president of the Westinghouse Electric & Manufacturing Company, New York; E. S. Marlow, manager, commercial department, Potomac Electric Power Company, Washington, D. C.; S. G. Thompson, Public Service Electric Company, Newark, N. J.; W. P. Kennedy, consulting engineer, New York, and O. H. Caldwell, *Electrical World*, New York.

For the National Electric Light Association, President J. B. McCall, Philadelphia, Pa., has appointed the following representatives: Frank W. Frueauff, president, Denver Gas & Electric Company, chairman; C. L. Edgar, president, Edison Electric Illuminating Company of Boston; L. A. Ferguson, vice-president, Commonwealth Edison Company, Chicago; Arthur Williams, general inspector, New York Edison Company, New York; W. W. Freeman, general manager, Union Gas & Electric Company, Cincinnati; F. M. Tait, president, Dayton Power & Light Company, Dayton; J. A. Britton, vice-president, Pacific Gas & Electric Company, San Francisco; T. I. Jones, general sales agent, Edison Electric Illuminating Company, Brooklyn, and T. W. Peters, manager commercial department, Columbus Power Company, Columbus, Ga.

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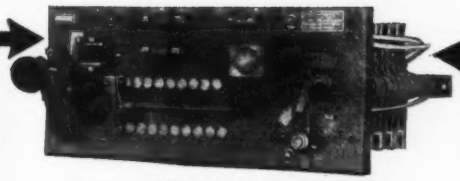

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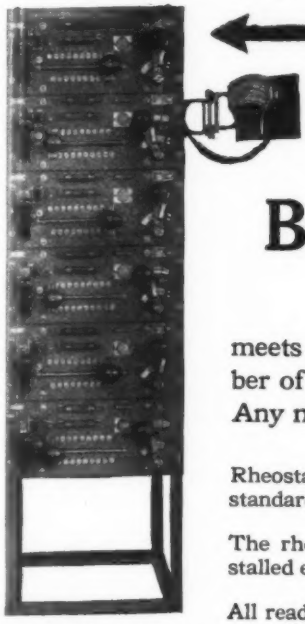

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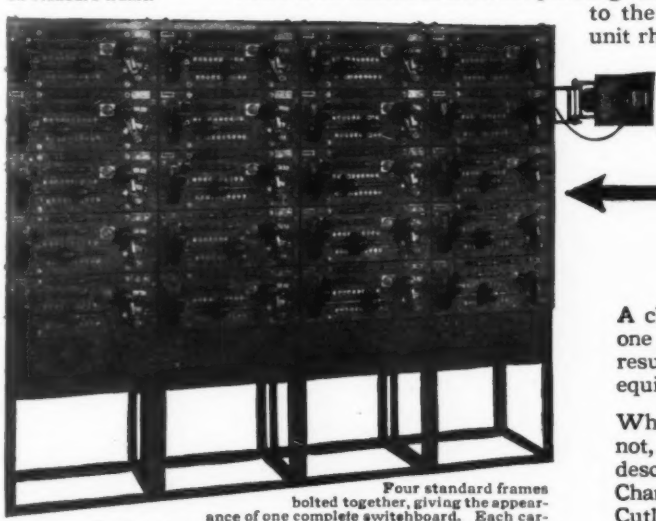

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